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ABSTRACT

This yearbook provides highlights of the work done by the various bureaus and offices of the Department of the Interior during 1970. The coverage is broad, relating to many aspects of conservation and the environment in the United States, in a descriptive, non-technical style. General theme of the report is the need for environmental management and the restoration and maintenance of an ecological balance. Topics considered include the fragile earth, individual responsibility for wise and prudent use of our land, re-creation of the man and land relationship, environmental research and repair work in replenishing the resources of our earth to counteract our explosive productivity, and the preservation of human heritage while developing and maintaining the quality of the natural environment. Numerous color photographs and art reproductions are presented throughout the yearbook. (BL)

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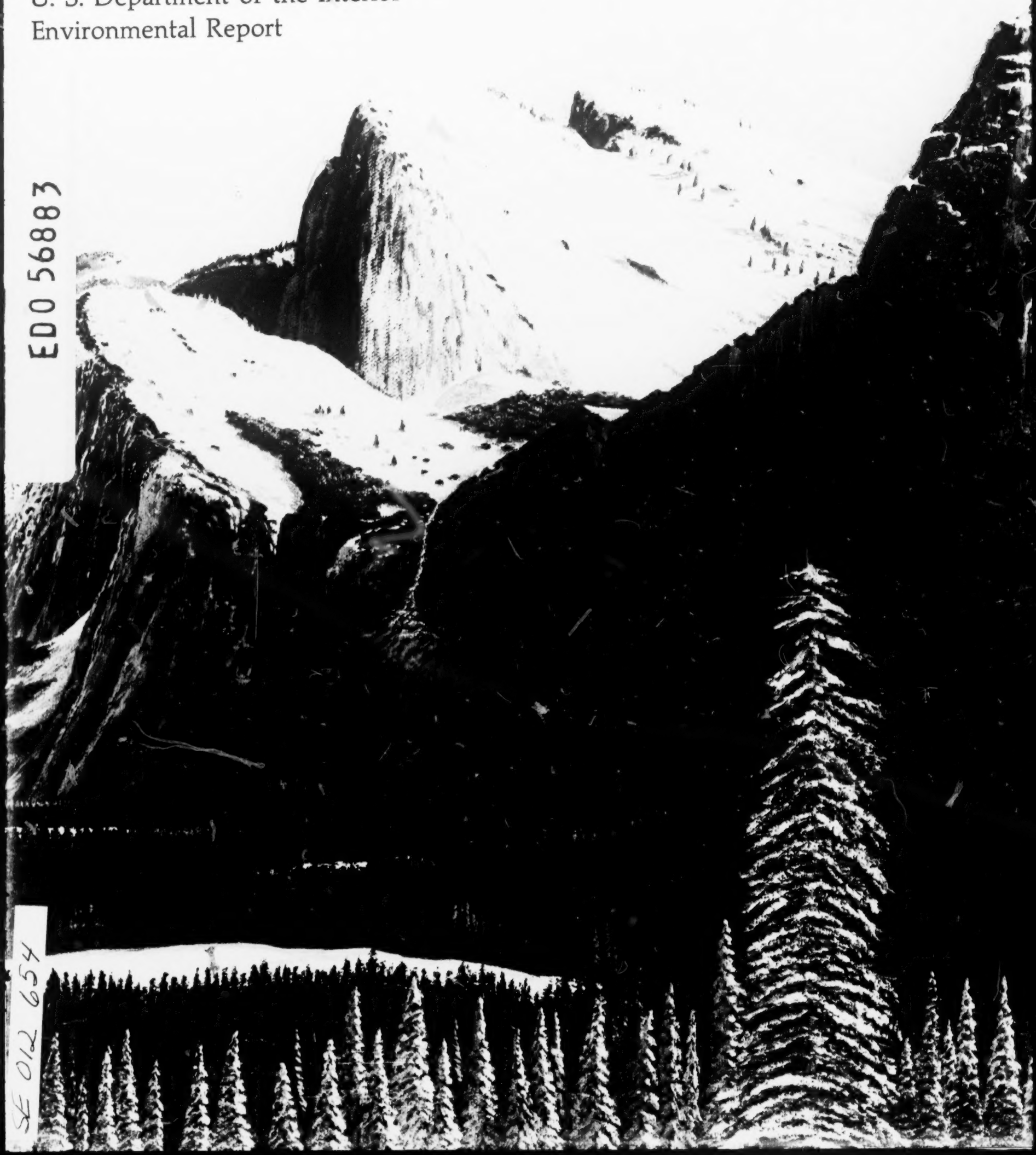
Our Living Land

U. S. Department of the Interior
Environmental Report



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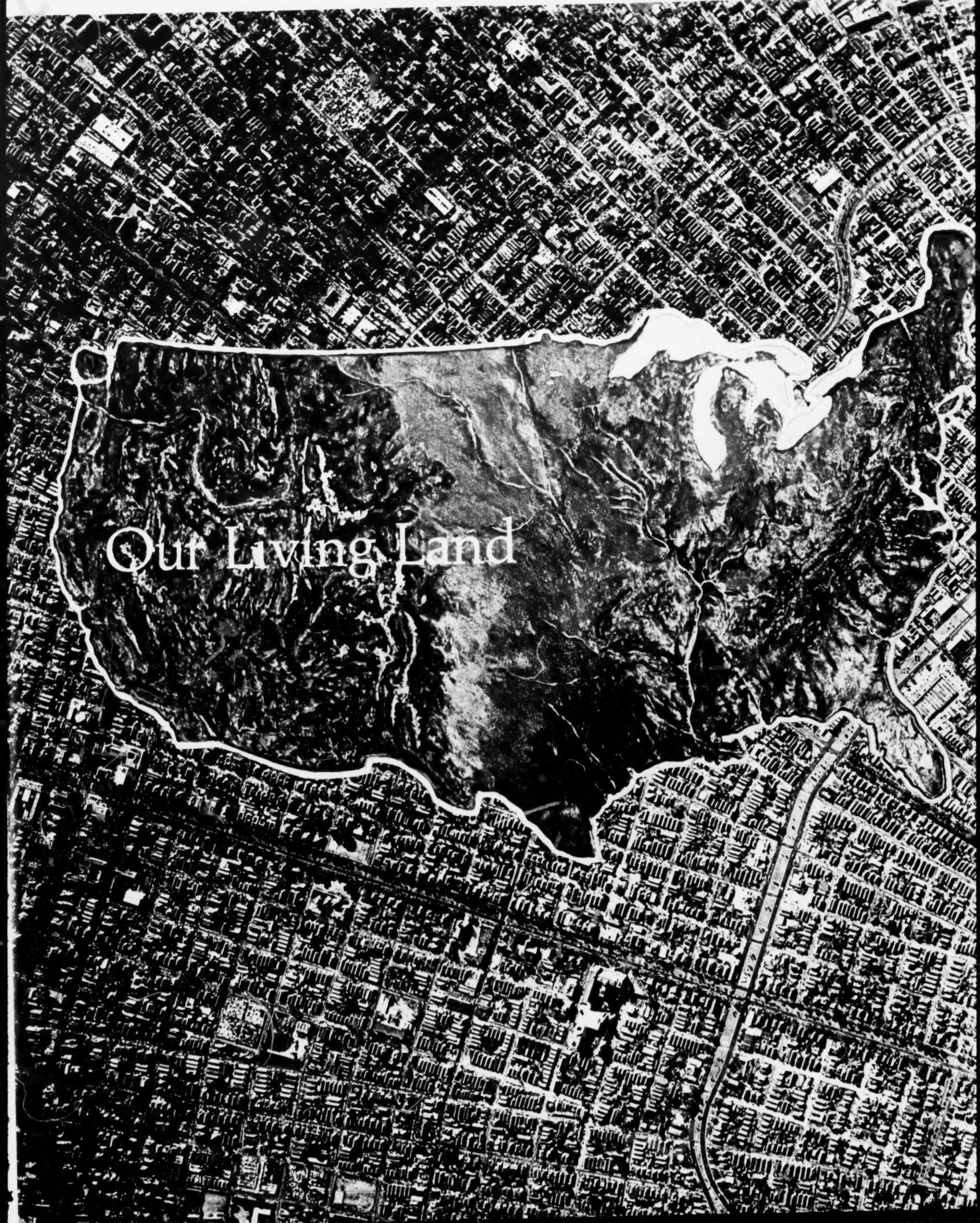

United States Department of the Interior Environmental Report

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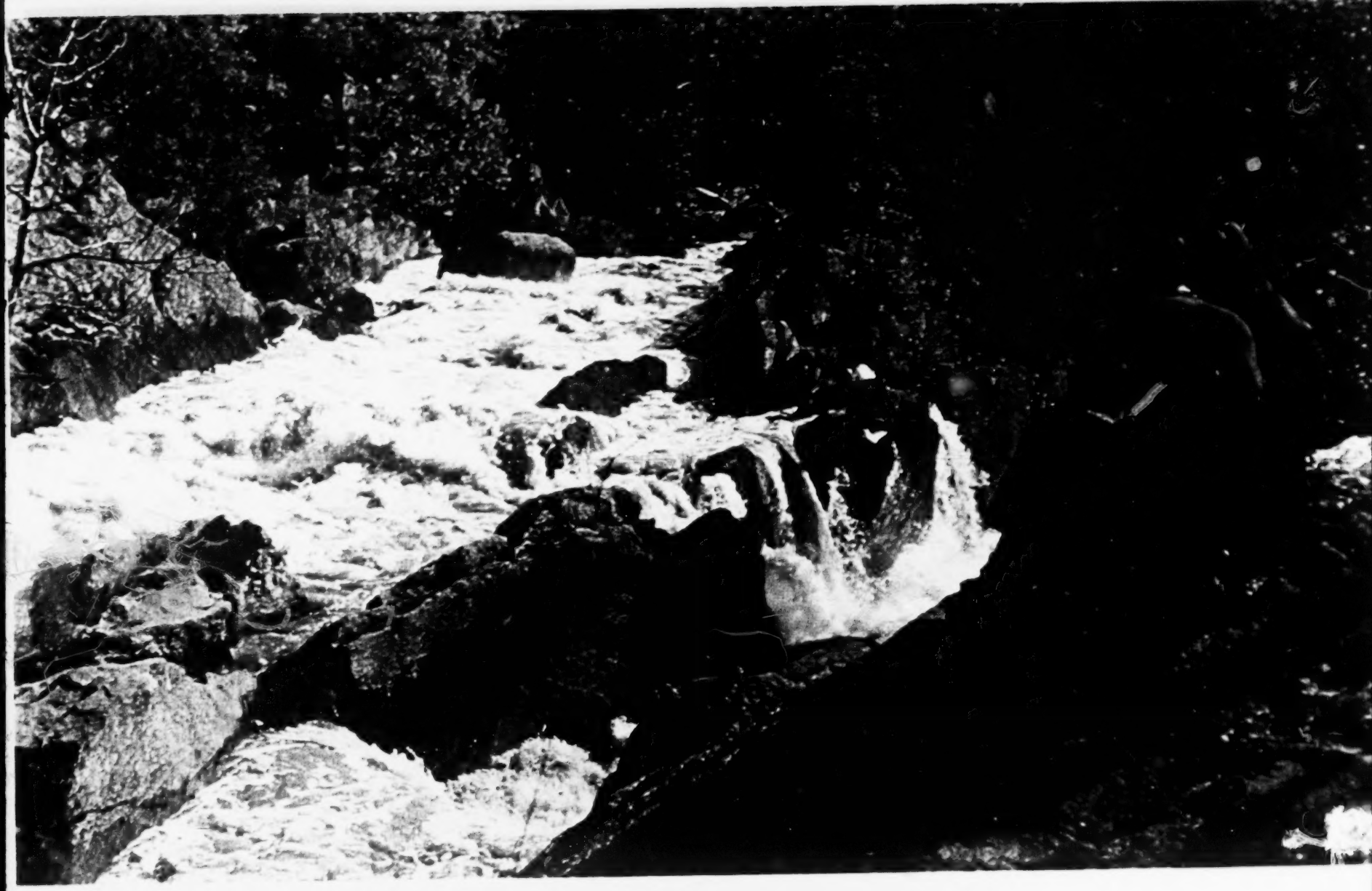


Foreword

Land was the beginning of the story of America, and land remains the foundation of our future.

When this land of ours was wilderness and the population sparse, the challenge was to conquer nature. The quality and vastness of the land whetted our ingenuity and our aspirations. Resources seemed limitless, potential for development infinite.

But that was another time. Our land and resources are *not* without end, and our demands upon them are greater than ever before. The challenge now is to manage the land with care for the future.

Significantly, President Nixon devoted nearly half of his 1971 Message to Congress on the Environment to specific discussions of how to make better use of our lands—public and private.

"The use of our land," he said, "not only affects the natural environment but shapes the pattern of our daily lives. Unfortunately, the sensible use of our land is often thwarted by the inability of the many competing and overlapping local units of government to control land-use decisions which have regional significance."

Rather than attempt to diminish the strong American tradition of local government, the President proposed legislation to establish a National Land-Use Policy which would encourage the States to work with local authorities in developing more rational patterns of land planning and use.

Of all the steps that can b taken to maintain a balanced e vironment as we continue to d velop resources, I believe none more necessary than a nation approach to land use in develo ment planning.

What one State does to a riv may not matter to that State, b its actions may be of great co cern for the States downstream.

What one community plans the way of an industrial park m mean a grave intrusion upon t environment of an adjacent co munity.

What one private develop plans in the way of constructi for a fragile coastal area m affect land, sea and life in t whole region.

We must learn to help our co

munities develop in harmony with their environment, rather than mangling the environment in the process of developing communities. This is the heart of sound land management, whether it be the management of public lands, which comprise about one-third of this Nation's territory, or whether it be the management of privately owned acreage.

We can, with planning, help free our communities of industrial sprawl, erosion, air and highway traffic jams, and the kinds of construction that foster pollution. We can bring more parks to places where people live—to urban areas where the natural environment has been overshadowed by concrete towers and where outdoor recreation space has been gobbled up haphazardly for short-term gain at the expense of environmental balance—and the long range interest of all. We can protect the quality of life in the neighborhoods of America by planning new construction with care. We can preserve the fragile areas of our land by monitoring and regulating the activity permitted upon them.

Primary responsibility and authority for land-use planning and management of non-federal lands rests with State and local governments, to be sure. But a national responsibility does exist to protect the total environment of our land, and this can only be accomplished by maintaining a consistent land-use ethic from coast to coast.

With a national land-use policy, formulated so that the property holder can still realize a reasonable return on his investment, we can keep development within the bounds of a general morality—a morality based on appreciation for the natural resources and a respect for the quality of human life.

Conservation in this sense neither begins nor ends with government, although governments at all levels must continually strive to give environmental considerations the highest priority. It is a responsibility inherent in our daily activities—within our commerce and industry, within our communities and neighborhoods, and even within the family circle, right down to the individual citizen whose litter is multiplied by 206 million daily.

Interest in the total environment should be on a level with economic interests or social interests, because it is the product of the interrelationship of both. It cannot be given a secondary place in our planning, either national or personal planning.

The President's 1971 Enivronmental Message to Congress ended with a plea for better, more informed citizen participation in all environmental matters. He noted that our educational system, at all levels, has a critical role to play. And he added:

"As our nation comes to grips with our environmental problems, we will find that difficult choices have to be made, that substantial costs have to be met, and that sacrifices have to be made. Environmental quality cannot be achieved cheaply or easily. But I believe the American people are ready to do what is necessary.

"This nation has met great challenges before. I believe we shall meet this challenge. I call upon all Americans to dedicate themselves during the decade of the seventies to the goal of restoring the environment and reclaiming the earth for ourselves and our posterity. And I invite all peoples everywhere to join us in this great endeavor. Together, we can hold this good earth in trust. We must—and together we can—prove ourselves worthy of that trust."

As far back as the turn of this century, Gifford Pinchot and Theodore Roosevelt spoke of planning in the development of resources and the right of the people to have their stake in a living land protected.

It is to these ends that the Department of the Interior will direct its missions. Its responsibilities include management of public lands, development of public resources, preservation of wildlife—and, in sum, protection of the well-being of people, through protection of the land base upon which they depend.

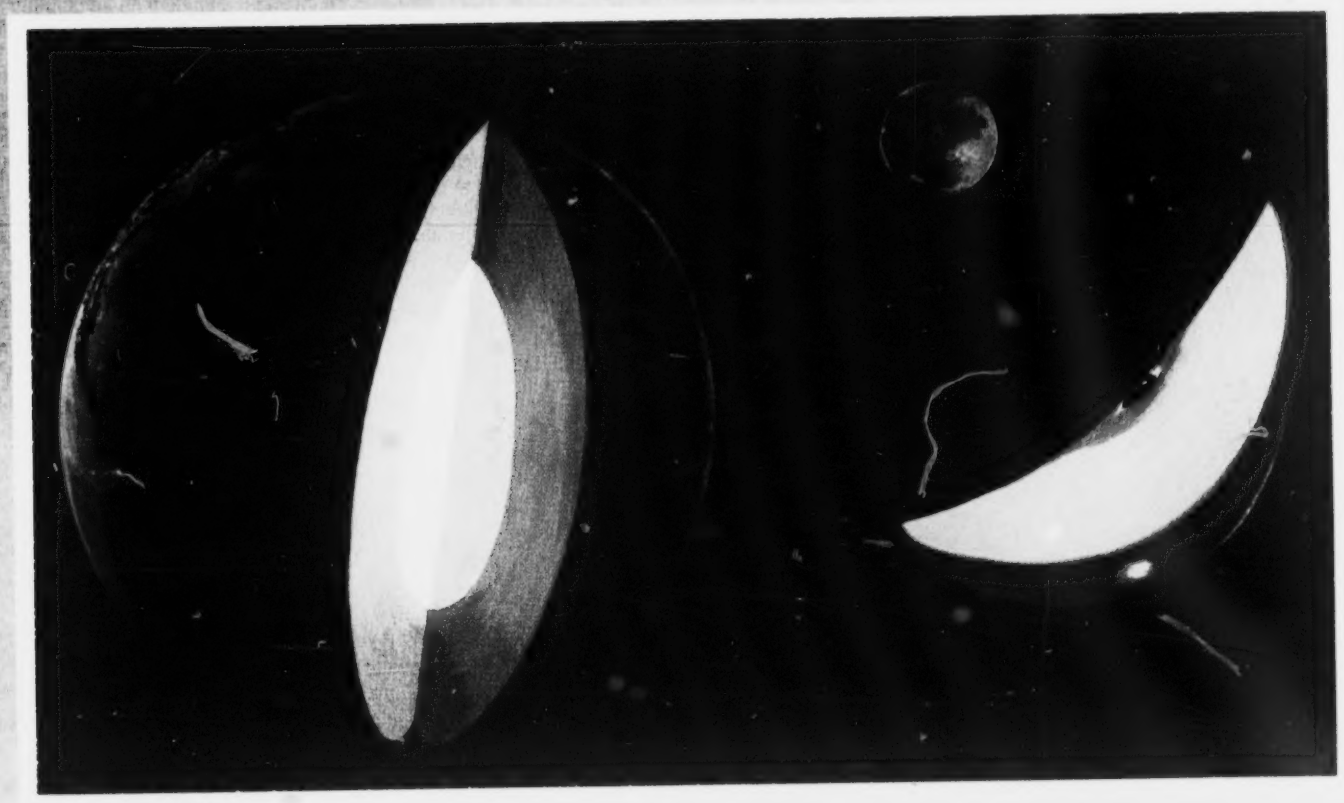
Rogers C. B. Morton
Secretary of the Interior

"Our land, its resources and use are man's future. If this generation fails to design, plan and manage this land with care, it is conceivable man and our world as we know it will cease to exist."

Congresswoman Julia Butler Hansen
Washington

The Fragile Earth

Man has built his civilizations on a crust of land thinner than the skin of an apple compared to the whole fruit.



Our planet came into existence some $4\frac{1}{2}$ billion years ago, and through this long span of time there gradually was formed a thin outer crust that we call "the land."

As geologic time is counted, man made his appearance only a moment ago, creating his large and small empires on a crust much thinner than the skin of an apple compared to the whole fruit.

Visible to man as continents and islands, the crust covers the earth. However, most of it—

nearly three-quarters—is screened by water, chiefly oceans and glaciers.

The earth's crustal surface—man's domain and vulnerable to a variety of natural and man-made occurrences—is tremendously versatile. It produces our food. It provides our basic fuels and metals. It supports our steel and concrete structures and our vehicles.

The thinnest part of this crust, the soil, is a fairly recent addition. The most productive, it is the most fragile. It must sustain life, but man reduces its vitality and hastens erosive processes.

Each day, rain and running water sweep 8 million tons of the land's substance into the sea. The material carried seaward contains natural nutrients. It also contains natural and man-made contaminants.

In a sense, our land must be considered a nonrenewable resource because some areas are being depleted far faster than nature is creating new fertile areas of productivity.

The natural riches stored in the earth's crust are finite, yet they are being depleted at ever-increasing rates. Some experts say that the world is overpopulated; others contend that it easily can support more life. Both agree, however, that better conservation practices are absolutely necessary on a sustained *global* basis if environmental and resource crises are to be avoided.

Man has altered numerous features of the earth's surface for his own purposes. But these changes have not always been to his advantage.

Despite man's efforts to modify some of the earth's features, ours remains a dynamic planet.

It operates within implacable frameworks of natural law and forces, and thus is hostile to many of man's endeavors.

Some of the continuing reminders that man is a tenant and not the "landlord" of the earth are volcanic eruptions. Such eruptions—part of the natural scheme of things since the earth first shuddered through creation—have time and again killed people and destroyed property. Still, man continues to populate volcano-prone areas in many parts of the world. In 1919, a mud-flow eruption from Kelud Volcano in Java destroyed scores of villages and snuffed out more than 5,000 lives.

Mt. Vesuvius, in 79 A.D., buried Pompeii and all its thousands of inhabitants. An explosive eruption of Java's Krakatoa in 1883 triggered a tidal wave that killed 35,000 persons. Mt. Pelee's warning went unheeded by 30,000 people in St. Pierre, Martinique, and they died, mostly by asphyxiation from poisonous fumes of the 1902 eruption.

Recent volcanic eruptions in Central America are reminders that hundreds of volcanoes are merely dormant—not extinct—and, like delayed time bombs, can threaten man and his works.

Earthquakes, also natural phenomena, occur with disturbing frequency and with catastrophic results in the many parts of the world that, because of their geologic makeup, are prone to these releases of energy.

The Peru earthquake in the summer of 1970 resulted in the deaths of more than 50,000 people and untold numbers of livestock and wildlife. Nearly half the deaths were caused by the collapse of unstable dwellings that could not withstand the shaking earth. Other victims were smothered under vast slides of ice, rock and mud, triggered by the shock, that moved at fantastic speeds down mountainsides in populated valley towns.

Moving glaciers are also constant reminders of natural forces that are not subject to man's control. Their advances and retreats reshape regional terrains. Although they store about three-fourths of all the fresh water in the world, man has not yet managed to utilize their full potential.

Such events as volcanoes, earthquakes, landslides and floods continue to have far-reaching impact on the earth's surface, as they have during the more than four billion years of the planet's existence. In themselves they are neither angry

Millions of years ago, the islands of Hawaii were formed in the midst of the Pacific as the ocean floor trembled and spewed forth lava and hot gases.

nor benign. They are merely relentless forces, constantly part of a grand system by which nature seeks equilibrium. Man must reckon with these forces when he and his works move into disaster-prone areas.

Man's sources of energy—oil, natural gas, coal, tar sands, oil shale and nuclear materials—were forged in the earth's crust by many and varied geological processes over long periods of time. Unfortunately, these resources have not always been developed with a concern for their eventual exhaustion.

The mining of coal is a good example. Man has been mining this fuel for about 800 years. But one-half of all the coal ever taken from the ground has been mined and burned in the past three decades. Underground mining in the United States still leaves about half the coal in place. This is because it is cheaper, *in the short run*, to abandon it and seek new beds to develop.

The petroleum industry is much younger than the coal-mining industry, but now meets a larger percentage of our energy needs. The first commercial well in the United States—at Titusville, Pennsylvania—was drilled in 1859 and struck oil at 69 1/2 feet. It produced only nine gallons of oil per day.

Today the United States has more than 500,000 wells, and the deepest producer has been driven to 22,790 feet. Their daily output is about 40 million times that of the first well at Titusville.

Consumption of most of our other non-renewable resources continues at exceptionally high rates. The value of domestic minerals produced in a recent year was approximately $27 billion, an eight percent gain in value over the previous year.

Demographers, who count the pulse of populations, estimate that the world has been the home of nearly 80 billion people. Today's population of over 3.5 billion is the greatest to occupy this planet at any one time. If the growth pattern follows forecasts, the world's population will double by the year 2000. In this context, the supply and demand pattern affecting our natural resources becomes a matter of vital concern.

Take forests as an example. Canada estimates that if all its 600 million acres of forest land were producing young trees they would generate enough oxygen to meet the requirements of 12

billion people. And in arguing for sound forestry methods, Canadians also point out that if trees are permitted to rot and die they would extract as much oxygen from the air as young trees produce.

The moral: Keep the young forests growing while we make use of the mature timber stands for our needs—and, in so doing, preserve and even enhance for man the life-sustaining features of the environment.

Perhaps this interrelationship of all living things is what John Donne sensed as he wrote that "no man is an island, entire of itself; every man is a piece of the continent, a part of the main."

This is the beginning of understanding the modern science of ecology. Only in the past few fleeting seconds—as man's tenure on earth is counted against a multi-billion-year history—have we entered the Age of Ecology.

This planet, on its whirlwind travels, has journeyed 210 trillion miles through space since the days, nearly five centuries ago, that colonizers from Europe gained a first precarious foothold in North America.

They came to that "good piece of geography," which Robert Frost said every nation must have.

Once forests marched down to the water's edge and extended inland farther than any man could

see, and there seemed no limit to the woodlands, the rich plains, the sparkling waters, the wildlife or the land itself. But the eons of painstaking craftsmanship by nature were not figured into the value put on the resources. Around 1700, prime land in Pennsylvania was selling at two dollars an acre. "Ordinary" land brought 50 cents. In Virginia, at about the same time, tens of thousands of acres were given away to promote settlement. Cutting and clearing, with little thought of erosion hazards, were routine operations in subjugating the land.

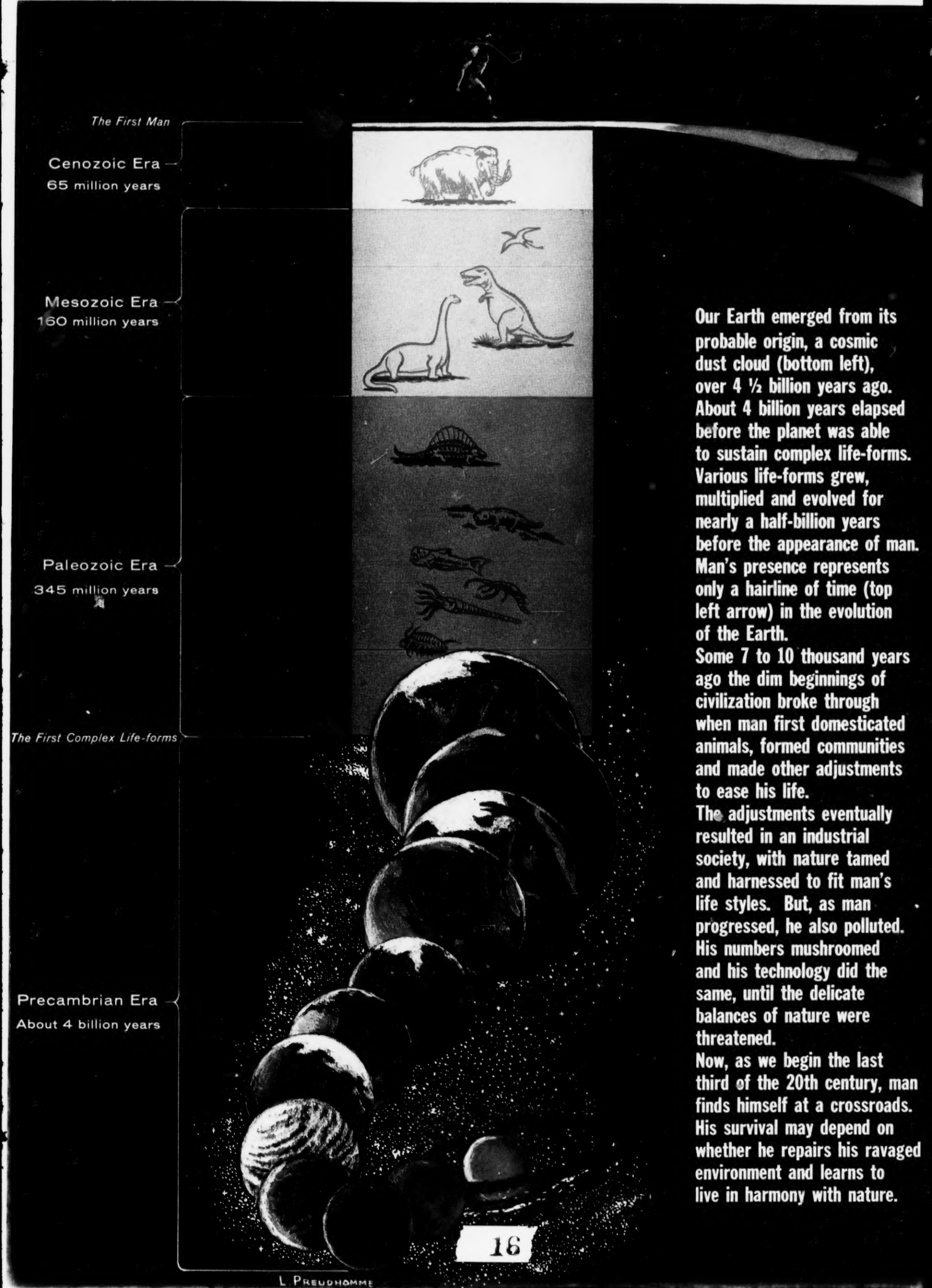
Even as the land and the resources later came to be recognized as limited, and often non-renewable, the old attitudes on utilization still prevailed, and have not yet been surmounted. Poor construction practices, random cutting of forests, indiscriminate mining methods, contamination by sewage and chemicals, and haphazard community planning all contribute to exhaustion of this, our land.

In pleading for wise use—without abuse—of resources, the Department of the Interior emphasizes that we must harvest our natural bounties judiciously because the resource storehouse is not automatically being replenished.

Although some of the worst examples of soil erosion and pollution in many forms are to be found in the vicinity of the Nation's Capital, there are nevertheless many indications that America is reversing the trend of land and water abuse. Development is being tempered with decisions—hard-fought decisions, some reached in the courts of law—that environmental degradation begins on the land and that here it must and will be halted.

At long last, people are beginning to heed the words written 108 years ago by the great American, George Perkins Marsh:

"Nature has provided against the absolute destruction of any of her elementary matter, the raw material of her works; the thunderbolt and the tornado, the most convulsive throes of even the volcano and the earthquake, being only phenomena of *decomposition* and *recomposition*. But she has left it within the power of man irreparably to derange the combinations of inorganic matter and of organic life, which through the night of aeons she had been proportioning and balancing, to prepare the earth for his habitation, when, in the fullness of time, his Creator should call him forth to enter into its possession."



Our Earth emerged from its probable origin, a cosmic dust cloud (bottom left), over 4 ½ billion years ago. About 4 billion years elapsed before the planet was able to sustain complex life-forms. Various life-forms grew, multiplied and evolved for nearly a half-billion years before the appearance of man. Man's presence represents only a hairline of time (top left arrow) in the evolution of the Earth.

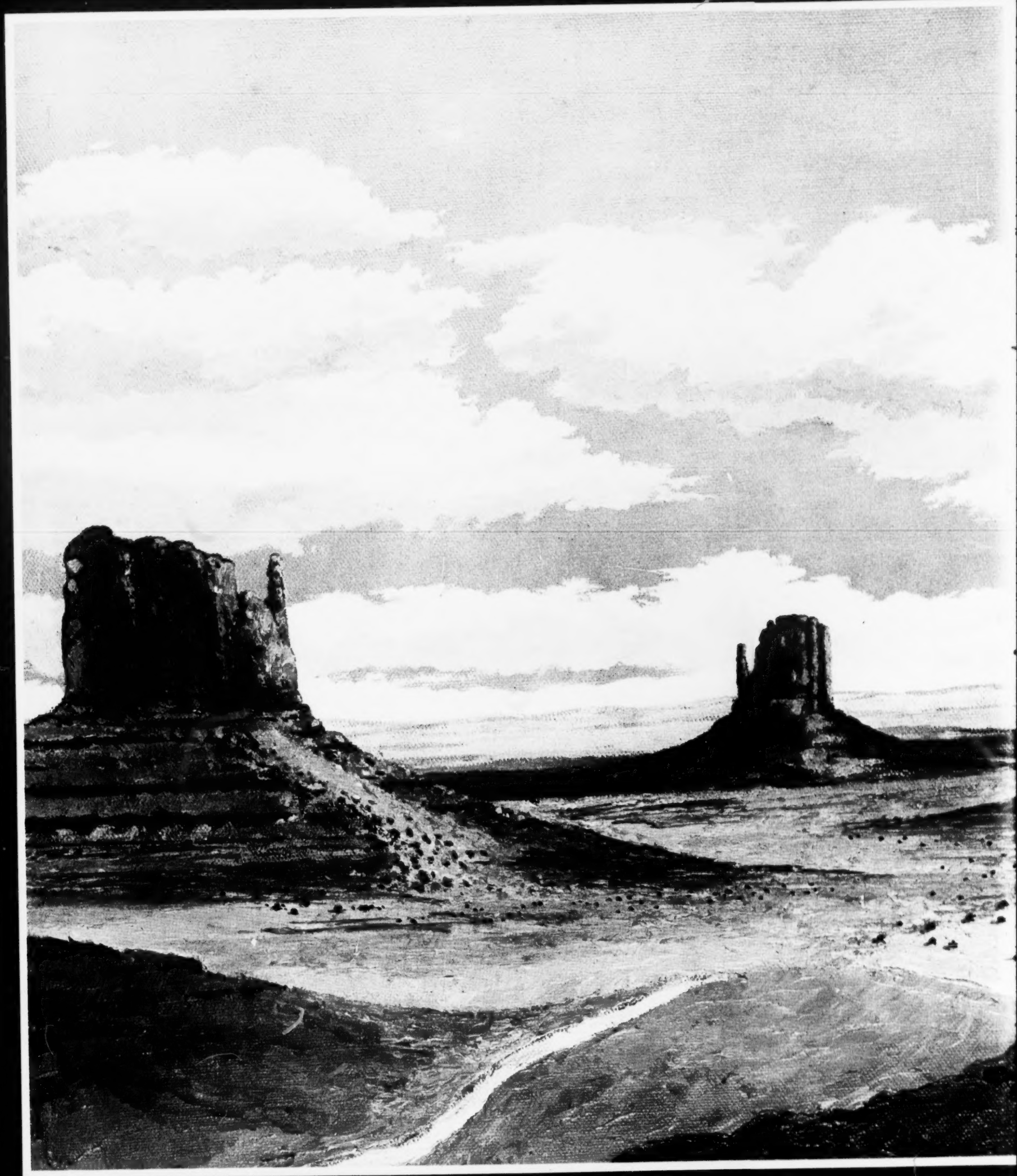
Some 7 to 10 thousand years ago the dim beginnings of civilization broke through when man first domesticated animals, formed communities and made other adjustments to ease his life.

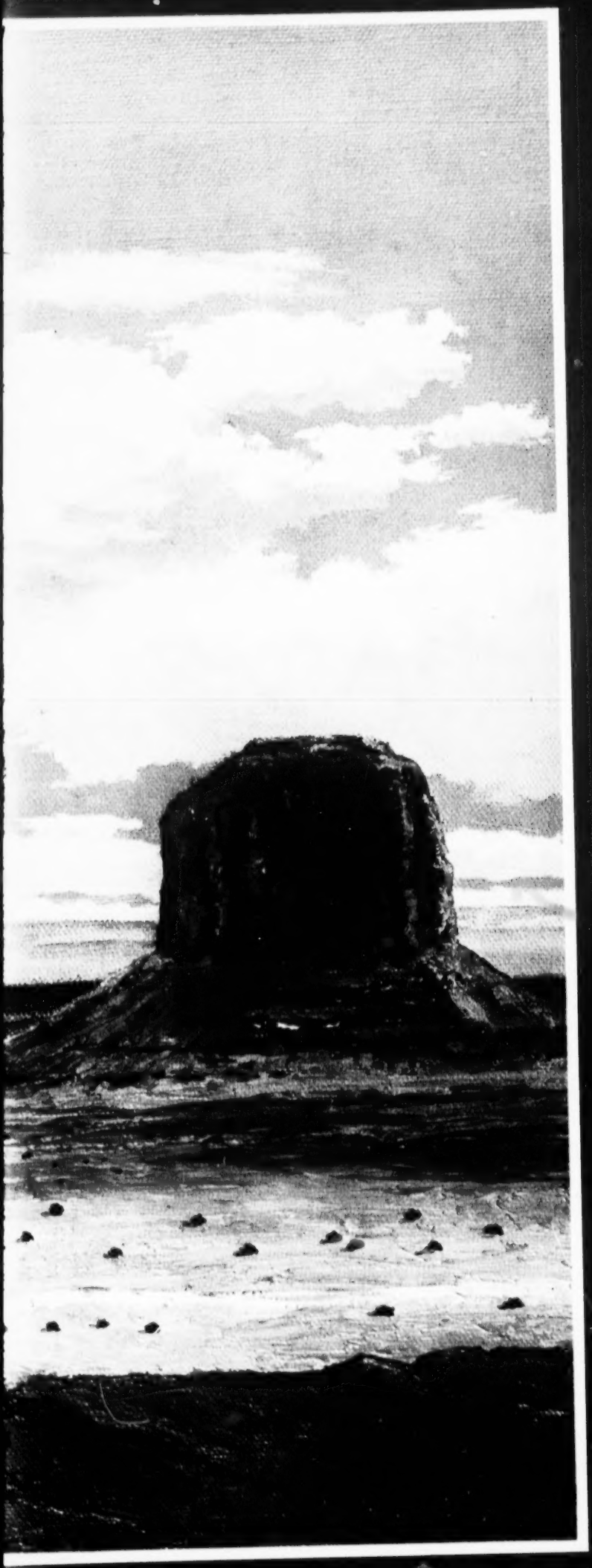
The adjustments eventually resulted in an industrial society, with nature tamed and harnessed to fit man's life styles. But, as man progressed, he also polluted. His numbers mushroomed and his technology did the same, until the delicate balances of nature were threatened.

Now, as we begin the last third of the 20th century, man finds himself at a crossroads. His survival may depend on whether he repairs his ravaged environment and learns to live in harmony with nature.

EARTH . . . then came Man

This Land Is Our Land





In the beginning, for us, there was land. This is where the saga of the American Republic starts. With the soil, stretching in all its variations from the one great ocean to the other . . . With the vegetation, the subsurface riches, the topography, the climate, the distribution of water, the multitudinous forms of animal and marine life.

The America we know today is a place with a distinct national character, the product of the natural environment even more than the product of imported political philosophies, social aspirations or economic concepts. All these found room to grow, to flex, to modify themselves in response to human demands—because the land was big enough and diversified enough to allow for growth and change.

The Department of the Interior is dedicated to preserving the *roots* of our national character.

Its story can well begin with the *Bureau of Land Management*, the *Geological Survey*, and the *Bureau of Reclamation*. The first is guardian of most of the lands in the public domain, seeing to their wise use; the second, a laboratory where the earth's vital parts are under continuing study so its needs may be understood and its life-giving qualities prolonged; the third, a place where water resources are developed to enrich the land.

This Land Is Our Land

"We can no longer hide behind the facade that it is not our concern what happens to the land--we are individually responsible for its wise and prudent use. Each individual must do his part or future generations--if there are any--will condemn us all."

Congressman John P. Saylor
Pennsylvania

This land is our land—from the city scene of Philadelphia, where the Founding Fathers wrote the Declaration of Independence, to the solitude of Kenai National Moose Range, Alaska.

Land of Our Fathers

The Bureau of Land Management (BLM) is custodian for 60 percent of the Nation's public lands—20 percent of the Nation's total land area—and is guardian of a resource that gave meaning to the American dream. The vast stretches of land to the west proved a challenge to men of daring from the time of the earliest settlement. The same restlessness that motivated European explorers to venture across the Atlantic drove pioneers from the security of established settlements to probe the unknown wilderness and establish new frontiers.

Shortly after the American Revolution, the concept of unclaimed land as public domain—and hence the common property of all the Nation's citizens—became national policy. Through the course of United States history, the western wilderness profoundly influenced national destiny. Vast expanses, great distances and an endless variety of landscape constituted both a challenge and the means of meeting many of the challenges that faced the Nation and its people. The concept of public domain was a prime factor in molding our national character.

As a new and struggling nation, the United States found itself in danger of being hemmed in along the Atlantic Seaboard by the ambitions of the great European powers for empire west of the Mississippi River. Had those ambitions been realized, our history quite possibly would have been a recounting of continental wars rather than one of growth and development.

The Nation's first challenge, then, was to explore and

possess the westward lands. To find out what was there, we sent men like Meriwether Lewis, William Clark, John C. Fremont, and a gutty one-armed adventurer named John Wesley Powell to be the eyes of the Nation. In less than a century, the United States spanned the continent. Major acquisitions included: the Louisiana Purchase, 1803; the Oregon Compromise, 1846; the Mexican Cession, 1848; and the last great addition to the public domain, the purchase of Alaska, 1867.

As land was acquired, the second challenge was to put people on it and to tie the Nation together in a viable union. This was the era of westward migration, a time when men of vision preached improved transportation and communication. Trails to Oregon and California grew dusty from the passage of covered wagon trains, and the tracks they left behind them became a roadway for the more elegant overland stage. In 1869, the Golden Spike was driven connecting the rails of the Union Pacific and Central Pacific, and creating the Nation's first transcontinental railroad.

Once the frontier was tamed and the land settled, development became our third national challenge. Eastern capital bought up mining claims, and oil derricks sprouted like weeds across prairie land. Cattlemen drove their herds to railhead up the Chisholm trail and cursed the barbed wire stretched to protect the crops of homesteaders. At times the bitterness between the two ways of life boiled over into bloodshed, but free land kept the homesteaders coming, and the cattleman retreated to drier, more rugged lands and made way for fields of waving grain. Settlements became towns and sometimes the towns grew to become cities.

There was so much land, there seemed no end to its bounty. Men killed off the buffalo and then the passenger pigeon, cut over the forest and let the sunlight in to dry up the swamp, plowed the new ground and called it progress.

Then somebody missed the wind whispering through the pine trees and stopped to wonder. Crops failed, springs dried up, gullies scarred the hillsides and the rivers ran muddy red.

As we moved into the 20th century, the Nation was face to face with its fourth challenge. We had to repair our damaged land and save it from the ravages of growing industrialization and helter-skelter urbanization. Great conservation leaders like Theodore Roosevelt accepted the challenge. From the public domain, the United States set aside national parks, national forests and land for wildlife.

Later, conservationists fought the dust bowl and erosion with the Soil Conservation Service and the Agriculture Adjustment Act. The Taylor Grazing Act created the Grazing Service to restore the range, and Bankhead-Jones made it possible to buy back land that should never have been homesteaded. New systems of land management introduced new concepts—terracing, cover crops, rest rotation and sustained yield. Some said it was Government meddling and foolishness, but conservation became a cause and a crusade on both private and public land.

A time of prosperity followed World War II. New, improved equipment continued to reduce the need for farm labor, and more farmers moved to the city. The Nation grew inward, filled up the cities and invented suburbia. The workday was no longer from sunup to sundown; forty hours became a week. With money in the pocket and time to spare, every weekend was declared a holiday and people looked for a place to play. Recreation boomed and populations exploded.

Merchants sold mobile campers, vacation guides and canned heat for camp stoves. Public lands were newly discovered by caravans of weekend migrants with dune buggies and four-wheel-drive vehicles, motor bikes and snowmobiles—all designed for cross-country travel. People out for a Sunday drive found traffic jams at picnic areas and public beaches.

Now the fifth challenge was clear: A limited land area had to serve all the varied needs of a fast-growing population. No longer was there an acre of worthless land. The world was finite and the vast public domain was growing more precious every day.

New programs were needed, and Congress enacted new laws and amended some that were not so new. The Recreation and Public Purposes Act of 1926 was amended to make public land available to local agencies to meet recreational and other needs. There was a Classification and Multiple-Use Act, 1964, to authorize an inventory of public lands and identify land needed in public ownership for multiple-use management.

A Public Land Law Review Commission was established in 1964 to make a massive review of public land laws and public land programs to serve as a basis for updated public land regulation. The PLLRC made a total of 137 recommendations after holding numerous meetings and conduct-

One-third of the Nation's land, some 755 million acres, is still in public ownership.

ing studies in 33 subject areas. Its 342-page report entitled *One Third of the Nation's Land* was presented to the President in June 1970. The Golden Eagle Program established user fees for the use of public facilities, and the money went into a Land and Water Conservation Fund to provide more facilities. There was also a Wilderness Act for national parks, forests and wildlife refuges, and provisions to preserve wild and scenic rivers.

In preparing for the challenges of the new decade, these things seem certain: The demand for the disposal of public land will continue but, when all outstanding obligations are met, a large area of public domain will remain in public ownership. BLM will continue to make public land available to meet the needs of States, local government, institutions and individuals where it is in the public interest to do so. The Bureau will continue to sell or exchange land as it seeks to block up its holding into more efficient administrative units. State selections of land authorized under the various statehood acts may be completed by the end of the decade.

The need for public land resources such as forage, timber and minerals will continue. A growing population means a greater demand for public land resources. BLM will continue to manage the land to produce goods for the American people. Intensive programs like the Vale Project, which was established in western Oregon in 1962 to upgrade more than 6 million acres of semi-arid rangeland, will be initiated to improve public land grazing. Continuing research to develop more productive strains of trees, investigation into the possibilities of fertilization of forest land and more intensive management of standing timber, such as pre-commercial thinning, will increase the timber harvest on public lands. These lands will continue to make a significant contribution toward meeting the Nation's mineral needs while better regulations and improved mining technology protect the land's surface from unnecessary damage.

The demand for recreation opportunities on the public lands will increase and possibly become the greatest future use of public land. At present levels of management, the increase in recreation-use through the next decade would overtax existing facilities and severely threaten the ecological stability of the land and its resources. BLM plans now call for new development to accommodate five times the capacity of existing recreational facilities. Much of this new development will meet the need for family-type recreation such as camping, picnicking and hiking.

Through the multiple-use policies initiated in the Sixties, public land will provide new recreational opportunity while continuing to meet the public's need for forage, timber and other traditional resources. BLM will continue to protect and enhance such intangible values as scenic beauty, open space and solitude. All programs and decisions affecting the public lands will be carefully weighed in light of their eventual effect on the total environment.

BLM's challenge for the Seventies, then, is threefold: It must continue to provide for the need of traditional users of public land resources; it must prepare to accommodate a wide variety of new uses; and above all, it must protect the integrity of the land. This will require more and better planning and more intensive management of all the land's resources. It will require imagination and innovation on the part of BLM personnel and support from the public.

Of the 16 million acres of arid land in southern California commonly known as the California Desert, 11 million acres are public land. Because of its location, the

desert offers recreational opportunity and aesthetic attractions to millions of Americans living in the metropolitan areas of Los Angeles, Phoenix and Las Vegas. It is a region of snow-capped mountains, deep basins, archeological sites, historic areas, fossil beds and a lot of open space and breath-taking scenery.

The yearly increase in numbers of visitors to BLM desert scenic areas suggests a horde of 50 million visitors a year by the year 2000.

The desert's fragile ecology is already suffering from overuse. Unless something is done, the impact of so much unregulated and uncontrolled traffic will soon destroy the very things that visitors come to find.

In 1968, BLM began a detailed study of the problem and has now proposed a management plan designed to allow as much use of the desert as is consistent with protection of the desert ecology.

The plan calls for more intensive recreational management to preserve the desert's soil and its plants, animals, artifacts and scenery. The plan proposes the establishment of a uniformed ranger force to enforce use regulations. It also calls for additional facilities such as roads to make more remote areas accessible, interpretation centers to explain the desert ecology, and centers for cultural and scientific studies of the arid environment.

More than 2 million acres of BLM lands in western Oregon produce approximately 1.3 billion board feet of Douglas fir timber each year and play a major role in the stability of the local economy. In recent years, there has been significant growth in the recreational use of these lands and a growing recognition of the role the forest plays in maintaining the stream quality and in protecting the soil.

In 1966, BLM initiated a study of its policy of allowable cut in light of the total environmental picture.

One objective of this study was to determine how much timber could be harvested from these lands on a sustained yield basis without damaging other resource values. In 1970, BLM proposed a reduction of allowable cut. A significant factor in this reduction was a proposal to withdraw certain areas from all timber production to protect other resource values. At the same time, BLM proposed a program of intensified management to increase the yield of timber on those areas where timber production is considered the primary value. Secretary Morton ordered the first phases of the BLM plan implemented. Further economic impact studies are being made.

Beginning with the establishment of Yellowstone National Park in 1872, the Federal Government has sought out and set aside areas from the public domain that have exceptional scenic beauty or unique resources for the enjoyment of all the people. In addition to those areas that have been reserved for national parks, there remain countless areas with outstanding aesthetic qualities. As the Nation has grown, population pressures and rising demand for recreational opportunity have increased the use of these areas and at the same time threatened their ruin because use has not been properly regulated and planned. BLM has now started to identify and manage outstanding scenic or otherwise unique areas of public land for their aesthetic and recreational values.

Outstanding among these projects to date have been:

The Red Rocks Canyon National Recreation Area near Las Vegas, Nevada—a 70,000-acre area dedicated to recreational use and the preservation of its unique plant and animal life and its historical and archeological values.

The Aravaipa Canyon Primitive Area and the Paria Canyon Primitive Area, both in Arizona—set aside to provide wilderness experience for visitors and to preserve environmental values.

The Rio Grande River Canyon in northern New Mexico and the Rogue River in Oregon—set aside to preserve wild and scenic values. The Rogue River is managed by BLM and the U.S. Forest Service.

The Department of the Interior has also proposed the establishment of a National Scenic Area in the Wrangell Mountains of Alaska.

Almost one-fifth of the Nation's land area remains in public ownership under administration of Interior's Bureau of Land Management. Space-wise it is our safety valve and gives us room for adjustment. If we respond with wisdom instead of greed, it can provide us with a quality environment for the foreseeable future. But we must manage it well.

Secretary Morton presents the Johnny Horizon National Award for Environmental improvement to the Boy Scouts of America.

Johnny Horizon is a fictional character created to symbolize the Bureau of Land Management's anti-litter campaign. Because of his success in arousing concern over littered public lands, Johnny was promoted and is now the Department of the Interior's symbol for a clean America.

Johnny was born of necessity. He came on the scene at a time when litter was spoiling the aesthetic qualities of the public domain. As unwanted objects, from old car bodies to gum wrappers piled up, BLM found it had neither the manpower nor the money to clean up. So the Bureau asked the public for help. Volunteers turned out by the thousands in Operation-Cleanup which removed tons of litter from selected areas.

Counting Our Treasures

The earth—specifically the thin outer shell or crust—is the "cornucopia" from which we obtain our vital resources. Getting to know the earth's crust is what the Geological Survey is all about. This agency seeks answers to basic questions about our land, water, soil and minerals: How they interract under varying natural conditions, and how they are affected and altered by man and his works.

Established in 1879, the Geological Survey is the largest earth science research agency of the Interior Department. Its earliest functions fostered westward migration by gathering knowledge of that unexplored territory. But it is also one of the most futuristic of Interior's components; its special knowledge and skills are part of the space age. Interpretations of the moon's surface have helped man reach the moon, and soon, "remote sensing" specialists will interpret data from earth-orbiting satellites designed to delineate and assess a variety of environmental problems.

To build the cornerstones of a quality environment, it is necessary to understand the forces and stresses of nature which, through more than four billion years, have shaped our land and its waters. To use our resources wisely, while at the same time protecting them from degradation, requires a knowledgeable assessment and inventorying.

Through research, the Geological Survey solves basic problems in hydrology, geology, geochemistry, geophysics and mapping, and develops new techniques and methods for appraising and conserving minerals and water. These investigations require the concerted efforts of many kinds of scientists, engineers and technical assistants, and the data they gather help solve problems related to the Nation's technological and population growth.

At this environmental crossroad in the Nation's history, the geological sciences may well emerge as the most critical science, and the Survey's role in helping solve environmental problems of the 70's promises to increase.

An example of Survey's involvement in environmental studies can be found in San Francisco where it is now engaged in studies of the San Francisco Bay area. In a geologist's terms this is a tectonically active area—a place where the earth is subject to stress. Large-scale horizontal and vertical movements are taking place, but so slowly that they are noticeable only over a span of many years, unless a sudden movement occurs that results in an earthquake. Teams of geologists and seismologists survey and observe the traces of the faults along which movements have occurred in the past so as to gain a measure of the likelihood of future movements and their related earthquakes.

Landslide-prone and other potentially unstable areas are identified and surveyed by engineering geologists. Dangers of sliding can be greatly heightened during an earthquake and compounded by increased development on marshlands or on fill marginal to San Francisco Bay.

In cooperation with the Department of Housing and Urban Development (HUD), the Geological Survey is developing maps showing slope, landslide potential, faults, ground characteristics, hydrologic data and other information on which sound land-use planning in the San Francisco Bay area depends. County and city planners will be kept informed as the program develops. This data will provide information on which local building codes, ordinances and zoning controls can be established.

Many millions of Americans are coming to realize that man must maintain a reliable inventory of physical characteristics affecting air, water, land, forests, minerals and streams. Without such an inventory, our efforts to maintain the "integrity" of the environment and to use it most efficiently are severely handicapped.

The topographic map is a key tool for maintaining this inventory because it depicts existing physical features and helps show how these features can be used to advantage.

The Geological Survey is carrying out a national topographic mapping program responsive to our urgent needs. The National Topographic Map Series includes 10 different kinds of maps. However, the principal standard map made by the Survey is the general-purpose topographic map covering a $7^1/_2$-minute quadrangle at a scale of 1:24,000

Johnny's slogan, "This Land is Your Land—Keep it Clean" spread beyond the BLM lands as concerned citizens adapted the program for use in their communities. In January 1970, Burl Ives, nationally known folk singer, joined Johnny in an appeal to the national conscience to stop litter. On September 23, 1970, a nationwide campaign was launched with a cleanup of the Lincoln Memorial grounds in the Nation's Capital.

In the weeks that followed, about a half-million volunteers in 40 States joined in to remove thousands of tons of trash from public lands, public parks, playgrounds and roadsides.

(1 inch on the map represents 2,000 feet on the ground). Map coverage at this scale is now available for about 56 percent of the total area of the United States. An additional 24 percent of the total area is covered with useable maps at a scale of 1:62,500 (1 inch represents 1 mile). The Survey plans to complete the coverage in one or the other of these scales in the 1970's.

As the environment changes, existing maps become outdated and reliability of the inventory deteriorates. An important step toward solving this problem was taken recently when the Geological Survey adopted an "interim-revision" program. New information is compiled from aerial photographs and subsequently printed in purple on the outdated map. This low-cost, rapid-production method of updating maps, shows new features such as interstate highways, industrial plants and suburban areas where rapid land developments are taking place.

The Geological Survey, in cooperation with HUD, is preparing an orthophotomap of the San Francisco Bay area. Such a map—combining the best of aerial photography and standard mapping techniques—can be used in transportation planning, urban renewal and development, and hydrologic, geologic and engineering studies.

The Survey has also produced an experimental orthophotomap of the Prudhoe Bay area, Alaska, and is now producing more than 20 orthophotomaps of the frozen marshlands between the Arctic Ocean and the Brooks Range in Alaska. These maps will be used in support of oil drilling and trans-Alaska pipeline activities.

Since 1968, when the first orthophotomaps covering the Okefenokee Swamp were published, twenty $7^1/_2$-minute orthophotomaps have been published in sales editions at 1:24,000 scale, and more than 200 new orthophotomaps are being prepared.

High-altitude jet aircraft photography and space-age photography offer a new technology that man can use for his benefit. The Earth Resources Observation Systems (EROS) program of the Interior Department, administered by the Geological Survey in cooperation with the National Aeronautics and Space Administration, is aimed at applying remote sensing data obtained from air and space technology to exploration, management and conservation of the earth's resources.

Experiments conducted from aircraft have shown the effectiveness of remote sensing in detecting such environmental problems as subsurface coal-mine fires and the presence of potential sinkholes in limestone areas; in monitoring thermal, biochemical and silt pollution in the Nation's waterways; in outlining wet ground which might indicate areas containing potential building problems; in

Infrared photography reveals changes in geographic features, urban growth and other trends difficult to observe with conventional photos.

delineating the source and extent of aggregates for highways and building construction; and in pinpointing sources of air pollution. Additional studies are being made by Interior bureaus to improve our capability to locate food fish; to determine the conditions of rangeland, protect these lands and improve stock production at the same time; to study erosion and changes along the coastlines and major rivers; and to identify trees that are under attack by insects or disease. All these studies will provide a basis for interpreting pictures coming from the initial experimental earth resources satellites planned for launching in 1972.

Design specifications have already been set up for this earth resources technology satellite (ERTS). Such a satellite will provide very large area views that would otherwise require hundreds of photos from aircraft. Also, repetition photos from space will record landscape changes as they occur. Information gained from ERTS will be available to those concerned with such studies and activities as agriculture, forestry, oceanography, geology, hydrology, geography and cartography. All nations will share the benefits.

Beyond topography, the chemistry of our land, and its impact on life, is also a matter for study by Survey scientists. In the present national concern over chemical pollution of the environment, it is frequently forgotten that there is considerable variation in the natural abundance of the chemical elements in the land. When the activities of a modern society result in the concentration of a chemical substance rising to a level hazardous to man's well-being, we call it "pollution," but medical researchers now suspect that naturally occurring levels of some elements may be high enough in some areas to have subtle, but large-scale effects on animals and vegetation, and on the health of the people of the region.

The Geological Survey for many years has been studying the variations in chemical composition of rock, soil, vegetation and water, and patterns of chemical variations have been used as prospecting guides to high concentrations of economically valuable elements. The experience gained now provides environmental scientists and medical researchers with a measure of the background levels of elements that can be expected under natural or normal conditions.

Many diseases exhibit definite geographic patterns in their rates of occurrence and severity, giving strong evidence of ties between environment and health. In addition, clinical studies are showing the importance of chemical substances, especially trace metals, in the human body. The chemical character of the environment is regarded by medical researchers as one of the most important environmental aspects.

The Geological Survey has several studies underway in direct cooperation with medical research groups. One, in cooperation with the U.S. Public Health Service, is a study of geochemical environments in two areas of Georgia that have highly different rates of death due to cardiovascular causes. Results to date show that the geochemistry of the two areas differs vastly. The area with the higher death rate contains significantly lower amounts of a number of trace elements in the soils and vegetation.

The largest Survey program in environmental geochemistry is being conducted with the University of Missouri in support of the school's epidemiological investigations. The program is concerned with the geochemistry of rocks, soils, vegetation and water. Although chemical elements may enter the human and animal food chain primarily through water and vegetation, their fundamental sources are the underlying bedrock and soils.

In general, health hazards due to excesses and deficiencies of chemical elements in the environment have been recognized only where the imbalance is so great that the effects are obvious. It is reasonable to expect that a great many more subtle relationships will be identified, but only through intensive study.

Prevention of environmental degradation is of paramount concern to the Survey in carrying out its responsibilities for managing federally owned minerals that are subject to lease and for overseeing the extractive industry's operations in locating, developing and producing such minerals.

In its programs, the Survey works to lessen, through proper supervision of all phases of lease operations, the possibilities of environmental pollution. These operations involve fluids, such as oil and gas, and minerals recovered through conventional mining methods, such as coal and

potash. Leasing regulations designed to achieve optimum resource development also are aimed at protecting the environment.

Today oil and gas production on land in the United States can be characterized as relatively stable. Resource experts say that, to meet demand, greatly increased supplies will have to come from the Outer Continental Shelf, the Arctic Slope or from additional imports. Unfortunately, all three alternatives have a high potential capacity for environmental pollution. The challenge will be to meet the Nation's demands for oil in such a way that the hazards of pollution are minimized.

Oil spills off California and in the Gulf of Mexico served to focus public attention on offshore oil operations. Responding to public concern after these spills, the Federal Government completely overhauled Outer Continental Shelf leasing, drilling and operating regulations. Added to these regulations were stringent, but fair, provisions requiring thorough consideration of environmental factors prior to lease sales and requiring total responsibility for control of spills, removal of pollutants, and liability for damages resulting from oil operations be placed on operators or lessees.

The Survey has increased its geologic, geophysical, engineering and inspectional capability on the Outer Continental Shelf to prevent spills from happening in the first place.

During the Seventies, many major environmental problems will center on water supplies and usage. Although the Nation, overall, has enough water to meet its needs, a critical challenge will be to develop and manage national water resources in such a way that our growing population can continue to use increased quantities of water of adequate quality without infringing on the water rights of future generations.

Among Federal agencies concerned with water, the Geological Survey plays a unique role. Unlike other water agencies, the Survey operates no water development projects, nor has it any involvement in managing the resource or regulating its use; rather, it serves as the Nation's principal agency for gathering basic water data and conducting water resources research. The data and research will help planners and managers anticipate problems associated with water and develop timely alternative solutions.

Water pollution is intensified by the development of a modern industrial society. Liquid wastes may be discharged in streams, lakes, estuaries and to sub-surface water-bearing rocks (aquifers). While information on the effects of liquid discharge to surface water systems has been available for several decades, the disposal of these wastes to underground systems on a continuing basis is a relatively new development. The long-range impact on the existing and potential water supplies is comparatively unknown.

Underground disposal of liquid waste has been associated with oil industry activities although wastes of other industries are being discharged underground in ever-increasing amounts. The oilfields of Texas alone contain thousands of wells which inject several billion gallons of oilfield brines into the ground every year. If this becomes

a common method of disposal, a series of questions is raised: How safe is the underground disposal of waste water in a particular area? How will it affect underground water supplies? What is the capacity of the buried rocks to hold liquid wastes? How will the wastes move within the rocks?

Survey scientists have already begun a search for answers to such questions in one potential trouble spot, the Oklahoma Panhandle and adjacent areas of Texas, Kansas, Colorado and New Mexico. Within this 47,000 square mile area, thousands of irrigation and public supply wells draw water from an aquifer which is the major source of water for the area. Lying below this formation is a formation that serves as a disposal reservoir for many oilfield brine injection wells. To date, the layers of impermeable rocks between the two formations appear to have prevented the oil wastes from moving upward into the fresh-water source, but the threat remains.

With additional studies, the Survey hopes to gain a better understanding of the geologic framework of the aquifer and related rocks in order to determine or predict the movement of waste water, and to establish a monitoring program that will detect any changes in quality in the fresh-water aquifer.

Another urgent challenge of the Seventies will be to

Oil spills, whether on water or land, threaten the environment. (Left) Infrared photography discloses the pattern of an oil slick. (Right) A leaking oil-well pump causes unsightly conditions and creates water pollution hazards.

anticipate the impact urban growth will have upon our water supplies. As the patterns of land use change from forest to rural to suburban, and then to urban communities, the Nation will witness two marked changes in its water environment.

First, as land is tilled for farming or modified for construction, the natural stability of the soil may be weakened until it is finally stripped by erosion. The result: Rock and soil debris will choke our streams. Recent Geological Survey studies in northern Virginia revealed that soil loss through erosion during a period of intensive highway construction jumped to an amount about 10 times the rate of erosion expected from the same area under farming conditions and about 2,000 times that expected if the area had remained forested. Similar findings resulted from studies in the San Francisco Bay region.

The second major effect of urbanization of water resources is increased water runoff. This results from the covering of the porous land surface with buildings, roads and parking lots. Rain falling on broad impermeable surfaces flows rapidly into stream channels rather than soaking into the ground. This situation intensifies the hazards of flooding. In times of heavy rain, the rapid runoff causes flood peaks to form more quickly and to be higher than they would have been under pre-urban condi-

Secretary Morton receives the National Atlas.

The first complete National Atlas of the United States was published in January 1971.

This comprehensive volume culminates eight years of planning involving more than 60 Federal agencies and numerous commercial firms, as well as individual expert consultants.

It is a reference tool of high quality for use by Congress, government agencies, business and industrial organizations, libraries, educational institutions and scholars throughout the world.

Measuring 19 by 14 inches, closed, the hard-bound volume was compiled and the project directed by Interior's Geological Survey. More than 41,000 items are indexed.

Maps—450 pages of them—indicate such characteristics as the geology, climate, water resources, and vegetation of the country; economic, social and historical data, and political structure (i.e. governmental subdivisions).

Also included are six transparent overlays to permit the user to identify boundaries and names, physical features and other basic data for co-relations with information on the special-subject maps. The price is $100.00.

Check or money order to:
Distribution Section, U.S. Geological Survey
1200 S. Eads St., Arlington, Va. 22202

tions. According to a Survey study in Charlotte, North Carolina, for example, the effects of urbanization have combined to double the discharge associated with a flood the size of which might normally occur every 20 years and to increase the height of such floods some three and one-half feet on most streams.

In a similar study on Long Island, Survey hydrologists found that, with the same amount of rain, the amount of water flowing off the land surface has more than tripled in the last 25 years.

Estuaries, the tide-affected parts of our coastal streams, will be of increasing interest to resource researchers and planners during this decade. The importance of estuaries is particularly evident to the more than 50 million people who live near them and who use them for recreation, for commercial fishing, for trade, commerce and industry, and for waste disposal. The use of the estuaries as waste disposal systems and as areas of landfill and urban expansion is coming increasingly into an abrasive conflict with the role of the estuaries as nurseries and breeding and feeding grounds for commercial fish.

To help resolve the growing conflict between the competing uses of our estuaries, the Geological Survey has begun collecting background information in key areas to learn more about the mixing and movement of estuary waters and their pollutants. Only since the mid-Sixties have the complexity and slow "flushing" characteristics of most estuaries been understood.

The Office of Water Resources Research (OWRR) is another agency in Interior concerned with conserving water resources. Through OWRR, research funds are awarded to various organizations, public and private. For example, OWRR is funding a joint study being conducted by the Conservation Foundation of Washington, D.C., and the University of Miami on the Rookery Bay area near Naples, Florida. The National Audubon Society has a bird sanctuary at Rookery Bay which, because of housing developments underway or in the planning stages, may be impaired by pollution, drainage, channelization or other environmental changes. The purpose of this study is to determine the possibilities and means of permitting development of an area without degradation of the environment.

Already, as a result of meetings of the investigators and others with a developer, plans for certain developments have been altered to avoid unnecessary destruction of vegetation, change in patterns of flow into and out of the Bay, and hazards of pollution.

The growing demand for electricity has resulted in increasing concern about thermal loading from generating plants and its effects on water quality and aquatic life. Study of a 4,500-acre reservoir in Missouri has indicated that heated water being discharged by a 475-megawatt powerplant into one arm of the lake may have beneficial effects. It may promote growth of fishes; keep an arm of the lake ice-free, thus opening up a winter fishery for local sportsmen; and provide a temperature regime which will allow introduction and survival of desirable forage fish, such as the threadfin shad which, typically, has a more southern distribution.

(Above) Further study of the effects of heated water discharged by powerplants is needed to determine when these discharges are beneficial and when detrimental. (Right) Bureau of Reclamation projects lure visitors to picnic grounds adjacent to reservoirs.

At other times, thermal discharges have proved detrimental to aquatic life. Results of Maryland studies, which documented some harmful effects of thermal pollution on shellfish and finfish, were used in setting water quality standards for the State.

Continued research will provide additional information of value in assessing the ecological impact of heated water discharges.

For example, Dr. Larry I. Boersma of Oregon State University, believes that by use of properly designed cooling systems, thermal pollution caused by nuclear powerplants can be avoided; in fact, he would hope to do better than that and put the heated water to some commercial use. His current research deals with the feasibility of using reactor cooling water from powerplants for irrigation of agricultural crops and the warming of soils.

Other OWRR projects deal with means of evaluating wild and scenic rivers, biological indicators of pollution, stream eutrophication, metropolitan water problems and ecological implications of "greenbelt" irrigation.

The Water Resources Scientific Information Center, managed by OWRR, publishes documents which promote effective research and reduce duplication of research effort.

The 1970's will be marked by a quest for balance, a course the Nation must take somewhere along a middle

road. Such a quest can be successful if sound, prudent and neutral earth science and engineering knowledge is weighed carefully by both the resource developer and the conservation-minded community in coping with problems of the environment.

Turning Browns to Greens

Seven decades ago, the Bureau of Reclamation came into being to develop the waters of the West and spread them upon the dry land so as to make it hospitable to settlers.

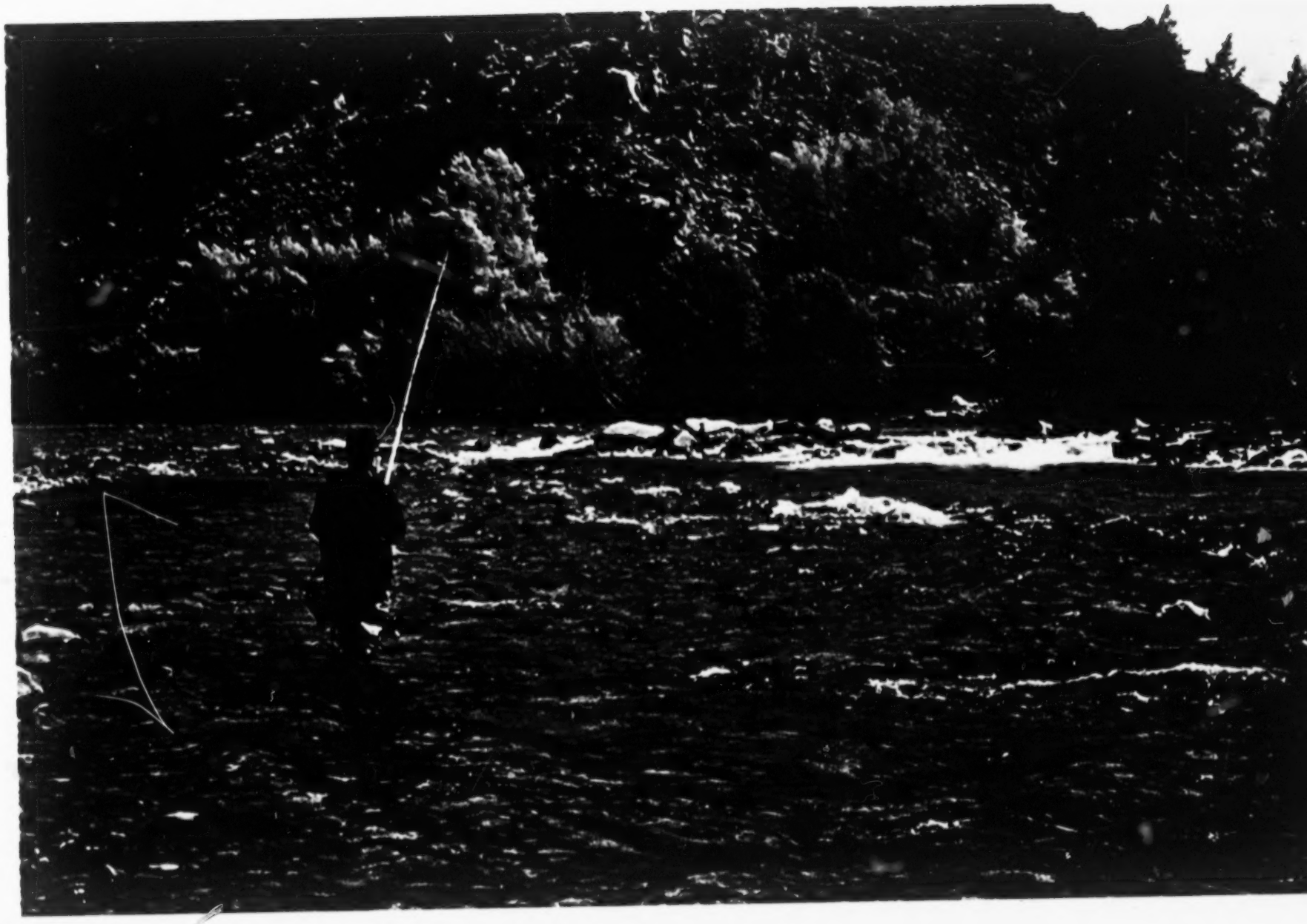
In many areas on the arid and semi-arid western plains, the land at the turn of the century was harshly hostile to man and wildlife, chiefly because of the scarcity of water. Mountain streams swept through the beautiful countryside to the rivers and thence to the sea, their uncontrolled flooding often destroying natural and manmade resources on the way. At other times, the streams dwindled to trickles or disappeared altogether, leaving vegetation to wither and die in the pitiless sun.

By building structures to regulate the flow of rivers and to store water in times of plenty for use in times of want, the Bureau of Reclamation helped Nature create an environment of land, water and air, in which men could live and prosper.

As the settlers moved onto the land, their activities inevitably caused changes in the ecology. At first, this circumstance evoked little concern. However, the accelerated—often destructive—development of the resources to support an ever-rising standard of living for an ever-increasing population has focused a spotlight on the danger to the land.

President Nixon recently called for action "to repair the damage already done and to establish new criteria to guide us in the future." To meet these goals, the Bureau of Reclamation strengthened and expanded its programs to enhance the environment and mitigate adverse environmental effects brought about by its projects.

Some of the steps regularly taken by the Bureau to maintain the land in a healthy and pleasing state are: Design of structures to harmonize with the natural surroundings; restoration of terrain at construction sites by means of seeding and landscaping; placement of power generating and transmission facilities underground or in inconspicuous locations; siting of access roads to avoid interference with scenic views; regulation of reservoir releases to improve water quality in the rivers of the West;



and management of project lands to protect soil and vegetation as well as recreation and wildlife values.

The record of the Bureau's 70 years of operation illustrates its past impact on the land and resources of the Nation. By regulating the flow of river water, Reclamation projects have averted much flood damage, have created improved habitat for fish in man-made reservoirs and salt-free streams, and have provided water-oriented recreation for millions of refugees from crowded cities. Some white-water fishing has been lost in the process, some natural wildlife habitat has been replaced with man-made substitutes. On balance, however, the benefits far outweigh the losses.

Each Reclamation project being considered for construction is carefully examined with a view to lessening the possibility of adverse effects on the environment and improving it where possible. A potential project is evaluated not only by Bureau experts but by other Federal, State and local agencies. Each project feasibility report submitted to Congress for authorization includes a statement on environmental impact.

The report on the Touchet division of the Walla Walla Project in southeastern Washington is a case in point. Principal features of the development will be Dayton Dam and Reservoir on the Touchet River, which will store water for irrigation and municipal and industrial use. The reservoir will support a substantial resident sport fishery, while the adjacent land area will provide waterfowl and wildlife habitat. Also, water will be released from the reservoir as needed and fish ladders will be installed at a downstream diversion dam to create anadromous fish runs into the river.

Each year, during the vegetable processing season from May to September, cannery wastes in excess of the capacity of treatment facilities escape into the Touchet River. This reduces the oxygen in the stream and threatens anadromous fish passage and spawning. Releases from Dayton Reservoir will suffice in quality and quantity to correct this seasonal situation. Since there are presently no sizable lakes in the project area, the outdoor recreation which will be furnished by Dayton Reservoir will be especially welcome to area residents.

Flood control to save the fertile land of the valley also will be an important function of the reservoir. The 1964-1965 floods in the Touchet River Basin were especially destructive, and the floods of early 1970 inflicted additional widespread damages. Many homes, irrigation and municipal water diversion facilities, highways, bridges, and a section of railroad were extensively impaired in the narrow river valley, and urban and rural areas suffered from silt and debris deposition. It is estimated that damage

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(Left) A sportsman angles for trout in the Gunnison River upstream from Blue Mesa Reservoir, Colorado. (Right) Louvered fish diverters will allow migrating salmon and steelhead trout to travel from the Tehama-Colusa Canal back into the Sacramento River.

losses of more than a million dollars would have been prevented had Dayton Reservoir been in operation during those floods.

Other recently authorized projects and those presently in the blueprint stage reflect similar environmental planning. Some wildlife refuges will be developed, some fish hatcheries will be built, and systems for extensive water salvage will be incorporated in a number of projects to improve the quality of waterways plagued by salinity and sedimentation.

Devils Lake in North Dakota was once a famed resort and fishery but is now unused because of extreme saltiness of the water; it will be restored as a feature of the Garrison Diversion Unit being constructed by the Bureau. Also, major recreational areas will be developed at eight water impoundments on the project, while fish and wildlife resources will be developed at nearly 40 locations

The benefits to fish and wildlife habitat enhancement are among the most important environmental results of Reclamation development. Some of the best fishing in the West is to be found in reservoirs behind Reclamation dams.

A notable example is the recently built Flaming Gorge Reservoir; it has become a magnet for anglers, who caught 3.7 million fish in the depths of the lake during its first five years. The 35-mile stretch of the Green River below the dam, which previously supported only negligible fishing because of siltation, is now recognized as one of the top trout fisheries of the Nation. In 1969 it yielded more than 25,000 trout. The managed release of clear, cold oxygenated water from the reservoir created this fabulous fishery and others on Reclamation projects throughout the West.

Managed releases from reservoirs also make possible nesting areas for waterfowl. The osprey, a large fish-eating hawk, whose numbers have been rapidly diminishing, has found an ideal home on Reclamation's Crane Prairie Reservoir in northwestern Oregon. The reservoir water has backed up into an area of dead lodgepole pine trees which suit the osprey perfectly as foundations for its nests. Located in the Deschutes National Forest, the reservoir section is being developed by the Forest Service as the Nation's first management area to preserve breeding grounds for this species that was in danger of extinction.

Not only reservoirs and regulated rivers but canals and ditches of distribution and drainage systems provide wildlife benefits on Reclamation projects. Irrigated fields are responsible for a phenomenal rise in pheasant population in the Dakotas and neighboring States as well as for an increase in non-game song birds. Excellent fishing has been developed in some of the large canals.

One of the Bureau's latest innovations to improve fishing in the West is the creation of artificial spawning beds for fall chinook salmon on the Tehama-Colusa Canal under construction in California.

A 3.2-mile canal stretch just below Red Bluff Diversion Dam on the Sacramento River is being developed to serve the dual purpose of salmon nursery and conveyance channel for irrigation water. In its delivery-room capacity the waterway will offer near-ideal conditions for spawning: Carefully selected gravel, water of the proper temperature flowing at a controlled velocity and with its naturally high oxygen content unimpaired.

Some of the salmon headed for the upper reaches of the river to spawn will be guided into this canal section to lay their eggs. Later, as the hatched fry emerge from their graveled sanctuary, they will be swept gently downstream to begin their journey to the sea. Four years later, their life span nearing its close, they will swim back to their birthplace to spawn and thus become the founding generation of the Tehama-Colusa strain of salmon.

The instability of the channel of the lower Colorado River, together with erosion of the banks and consequent heavy silting, has long posed problems related both to water supply and to the environment.

About 25 percent of expenditures of the Bureau's program there goes for fish and wildlife and recreation features to meet the requirements of the dozen or more Federal, State, and county recreation areas and wildlife refuges located along the river below Lake Mead.

Improvement of the quality of the water is being accomplished by reducing the amount of sediment transported. Dredging of selected stretches of the river and the contemplated control of phreatophyte growth along the banks will salvage much water, leaving sufficient cover to provide wildlife habitat.

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The marshland in the area actually owes its existence to Reclamation dams and other regulating facilities on the river. There were almost no marshes in the lower Colorado basin prior to 1935, when Hoover Dam was built, because the streams in the area dried up every year in the late summer. Now marshes, with their fish and resident and migratory waterfowl populations, occupy between 10,000 and 20,000 acres of the valleys of the lower river.

One of the most ambitious plans for overall environmental preservation and enhancement is being undertaken at the Grand Coulee Dam area on the Columbia River in Washington. There the Bureau is building a third powerplant which will make the Coulee power facility one of the largest hydroelectric installations in the world. (A noteworthy aspect of hydroelectricity is that it produces no pollution side-effects.)

The architectural concept of the third powerplant building, the forebay dam and related facilities also calls for an attractive visitors' center and tour circuit system which includes an outside glass-enclosed elevator and viewing galleries to enable visitors to see the details of the installation as well as the beauties of landscape and riverscape.

The aim of the Grand Coulee environmental plan is to meld the natural beauty of the area and its unique geological history with the manmade features of the great dam, its reservoir and the powerplant. This should make Grand Coulee, already an outstanding tourist attraction, a world-famous showplace.

Looking beyond the third powerplant construction, the Bureau contracted with a second architectural firm to develop a coordinated master environmental and recreation plan for the area surrounding the complex. Federal, State, and local government agencies and other organizations have been invited to participate in formulating and carrying out comprehensive environmental planning through an advisory council. The panel will consider such activities as zoning, routing of highways, parking areas, public utilities, schools, hospitals and development of the tremendous scenic and recreational potential of the area. Thus, the civic, industrial and social development of the entire area can be coordinated.

The Columbia Basin project, of which Grand Coulee Dam is a principal feature, has already had a significant impact on the basin. In addition to upgrading agricultural production and producing great quantities of hydroelectric power at Grand Coulee, it has sparked growth and progress in many small towns and has been directly responsible for establishment of some new towns. As the Nation seeks to solve the problem of overcrowded urban areas, with their teeming, ugly ghettoes, the development of smaller communities in the West—furnishing opportunities for employment and pleasant living in a clean environment, with easy access to open spaces—presents a possible solution.

Supplying water for municipal and industrial use has assumed an increasingly prominent position in the Reclamation program as larger numbers of people and businesses have moved West.

The accelerated demand of industry for electric energy

Putting the Brush to Reclamation's Projects

The Bureau of Reclamation has undertaken a new and exciting venture. It has invited several of the Nation's outstanding artists to paint their reactions to Bureau projects. An abstract painting is fully as acceptable as an entirely representational canvas. The artists submit preliminary sketches and drawings as well as the finished works. The preliminary sketches will comprise a unique record of an artist's immediate response to the man-made wonders of his day.

GLEN CANYON DAM
Norman Rockwell
Oil on canvas, 51" x 77"

TULE LAKE WILDLIFE REFUGE
John W. McCoy
Watercolor on paper, 30" x 19"

ELEPHANT BUTTE LAKE
Peter Hurd
Watercolor on paper, 26" x 40"

OLYMPUS DAM AND LAKE ESTES
Xavier Gonzalez
Tempera on paper, 22" x 30"

has stimulated development of the coal deposits of the West to provide fuel for thermal-generating plants in locations where water, as well as coal, is available. Unlike hydropower generation, steam generation involves the prospects of air and water polluting by-products. To combat this danger, the Bureau of Reclamation includes provisions in its contracts requiring strict compliance with air and water pollution control measures.

Since 1962, the Bureau of Reclamation has been conducting research into weather modification with a view to helping resolve water resource problems, especially in the arid West. By selectively seeding clouds and storm systems in the mountains, the amount of precipitation can be significantly increased in the upper reaches of the western river systems, resulting in greater storage in Reclamation reservoirs. It is estimated that up to 2 million acre-feet of water can be added annually to the Colorado River storage by cloud seeding, a circumstance that would go far toward relieving the drastic water shortage in that basin.

Managing the atmosphere by seeding and other methods being investigated by both public and private interests can help solve many water-related problems by augmenting stream flows during low flow to aid in reducing pollution; diminishing the damaging effects of hail, drought and flood; and lowering fire hazards. Also, increased precipitation can aid in scouring pollutants from the atmosphere, thereby cleaning the air.

A study conducted for the Bureau to investigate effects of weather modification on the ecology concluded that the changes in animal and plant life resulting from the seeding program would be very gradual and that no catastrophic changes in ecosystems are anticipated.

Early in 1970, the Bureau contracted with a private firm for a cloudseeding pilot project in the San Juan range of the southwestern Colorado Rocky Mountains. At the same time, it engaged three Colorado educational institutions to plan a comprehensive ecological monitoring program in the area before any actual seeding is commenced. By such means, ecological changes can be identified and steps taken to avert or mitigate undesirable effects and to promote beneficial aspects of the operation.

Another seeding pilot project is underway in the Truckee-Carson River basin in California and Nevada. The five-year program is being accomplished by an educational institute under contract to the Bureau in the hope that it will point the way to increasing the inflow into Pyramid Lake. During the past few years, this trout fishery has suffered as a result of a steadily lowering water level, and increased precipitation in the headwaters should help alleviate the debasement of the fish habitat as well as provide an adequate water supply for other water users.

"Project Skywater," Reclamation's atmospheric water resources program, constitutes one of the brightest prospects for meeting today's environmental crisis. It holds great promise for preventing depredations to the living land that is America.

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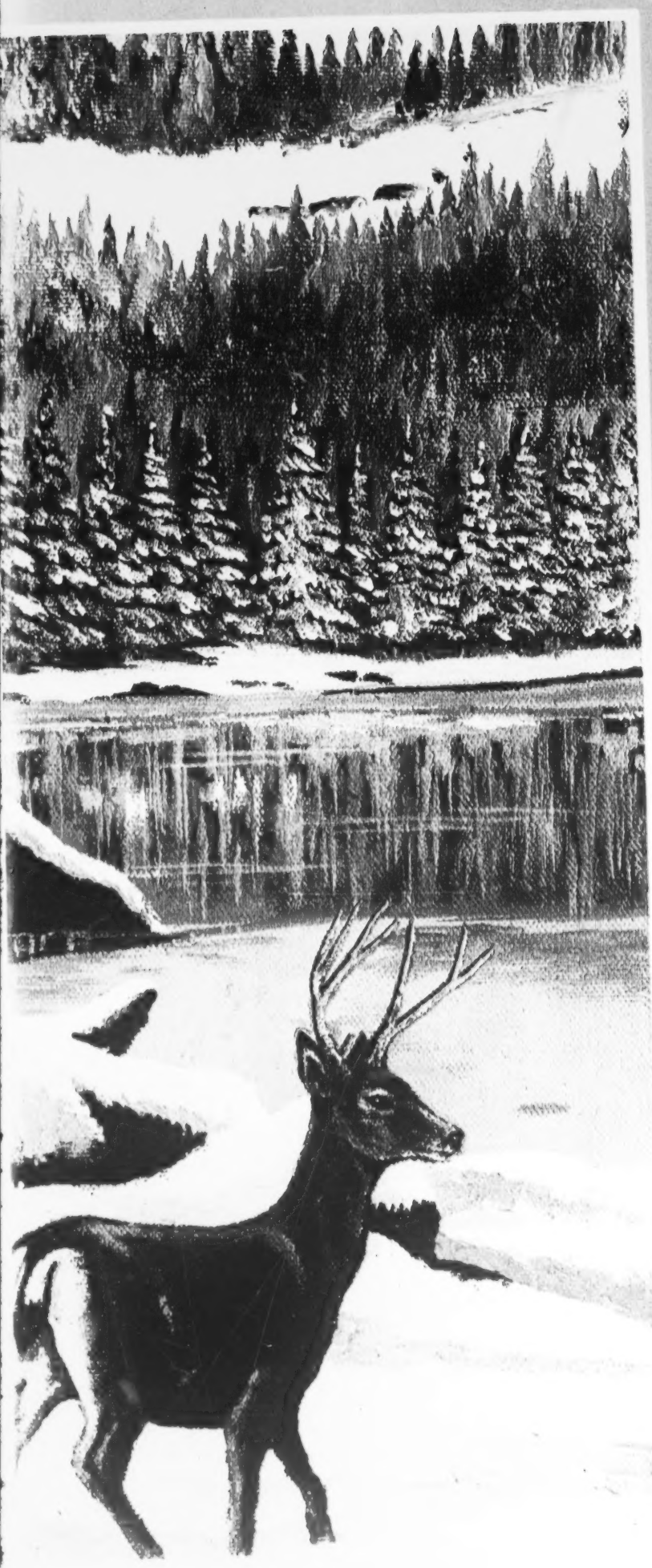
Getting Closer to the Land



When historians look back upon our time, perhaps they will define the 20th century as the point when man's yen for physical comfort, easy mobility and speed reached a climax.

We are loosened from our hereditary mooring, the land. Land had traditionally been the security of communities of people. It used to be that the land possessed us as much as we possessed the land, and there was security in the marriage.

This sense of security is missing in the 20th century. We have drifted away from the land. We have lost the *feel* of it and the respectful love for it that had been our mooring.

Getting to know the land all over again is our need today.

Three sister agencies of the Interior Department have as their mission the development of lands and resources for recreation—re-creation of the man and land relationship. They are the *Bureau of Outdoor Recreation*, the *National Park Service* and the *Bureau of Sport Fisheries and Wildlife*.

They help bring outdoor activities to city people, city people to the country, and reunite man with his wildlife neighbors on this planet. Interior's *Job Corps* joins them in helping deprived youth experience the touch of the land.

Getting Closer to the Land

"There is a new consciousness of the land resource; new evaluations, new awareness of careless exploitation that has had only economic progress as its rationale. The latter is no longer tenable to a society demanding new emphasis on the public interest. There is no doubt that our generation is called upon to forge a new land ethic for the Nation--one that demands a real concern for our total environment, based on wise and sensitive planning and use of our land resources."

Senator Henry M. Jackson
Washington

Man derives tranquility through recognition of his place in the natural order.

Town and Country Scene

More than a century ago, New York City purchased a strip of land in the heart of Manhattan for use as a park. This "central park" became a landmark, a prototype for other cities.

With growing urbanization, the need for close-to-home recreation has increased; but acquisition of park areas has fallen short of demand. To meet expanding needs, the Bureau of Outdoor Recreation (BOR) helps cities purchase and develop recreation land and facilities.

The Land and Water Conservation Fund is the basis of BOR's grant programs. The funds are apportioned each year among the 50 States. States that have cities with more than 250,000 people may receive additional money to help provide needed play and recreation areas.

In addition, BOR is evaluating the recreation needs and potentials of areas adjacent to several large urban centers, to determine whether they might be developed primarily through State or local initiative. Among the areas under study are the following:

The *New York Harbor area,* which comprises five water-oriented sites in New York and New Jersey—Breezy Point, Sandy Hook, Jamaica Bay, Great Kills and Hoffman-Swinburne Island.

The *lower Connecticut River area,* extending from Hartford, Connecticut to Springfield, Massachusetts. A Bureau of Outdoor Recreation study already has recommended establishment of a three-unit, 56,700-acre recreation area in parts of Connecticut, Massachusetts, Vermont and New Hampshire.

Parallel Federal actions could help create a 300-mile-long

Connecticut Valley Trail for hikers, and strengthen programs for pollution abatement and stream improvement.

The *Golden Gate area* in the San Francisco Bay region providing an ideal natural setting for expanded outdoor recreation. Preservation of Golden Gate greenery is in competition with plans for apartments and office buildings. Four-fifths of the study area already is owned by public agencies; thus a park would be relatively inexpensive to establish. It would encompass 25 miles of splendidly scenic shoreline.

The *Meramec River, southwest of St. Louis.* Thirty-five miles of the area are within St. Louis suburbs; and the remainder is within easy day-use distance of that city.

The St. Louis metropolitan area has more than 2 million residents. The area's population is expected to double by the year 2000. Nowhere else in the Central Midwest is there an underdeveloped recreation resource of such quality located so close to a large population center in need of recreation alternatives.

The *Buffalo Bayou region* near Houston, which could utilize 26,000 acres of two Federal flood-retention reservoir sites west of the city.

The Addicks-Barker reservoirs are located in Harris and Fort Bend Counties adjacent to the western edge of Houston city limits. The area is characterized by flat grassland with a moderate cover of trees. Dense woods are on the shore of the larger creeks which dissect the reservoir sites. The area would mean opportunities for close-in recreation in a high quality, spacious environment for Houston residents.

The *Chattahoochee River in and near Atlanta,* offering a 25-mile stretch of free-flowing stream from Jones Bridge north of Atlanta to Peachtree Creek in the heart of the city. The river provides a scenic water corridor that would connect a complex of outstanding natural resources well adapted for urban recreation use. The continuous strip of land includes a wide variety of topographic features ranging from 200-foot rock cliffs to meandering floodplains with sandy beaches.

In and around *the city of Denver.* Eight existing or proposed reservoir developments, various riverways within the South Platte drainage system, and important wildlife areas offer new recreation potential.

Much of the area is already in public ownership. The close proximity of its resources to the heart of the city would make more public, close-in recreation opportunities available to city dwellers.

The *Upper Mississippi area,* from Minneapolis to the Missouri River near St. Louis. This region offers excellent opportunity for camping, fishing, hunting, sight-seeing, boating, canoeing, picnicking, hiking, horseback riding, nature study, swimming, group camping, winter sports and other activities.

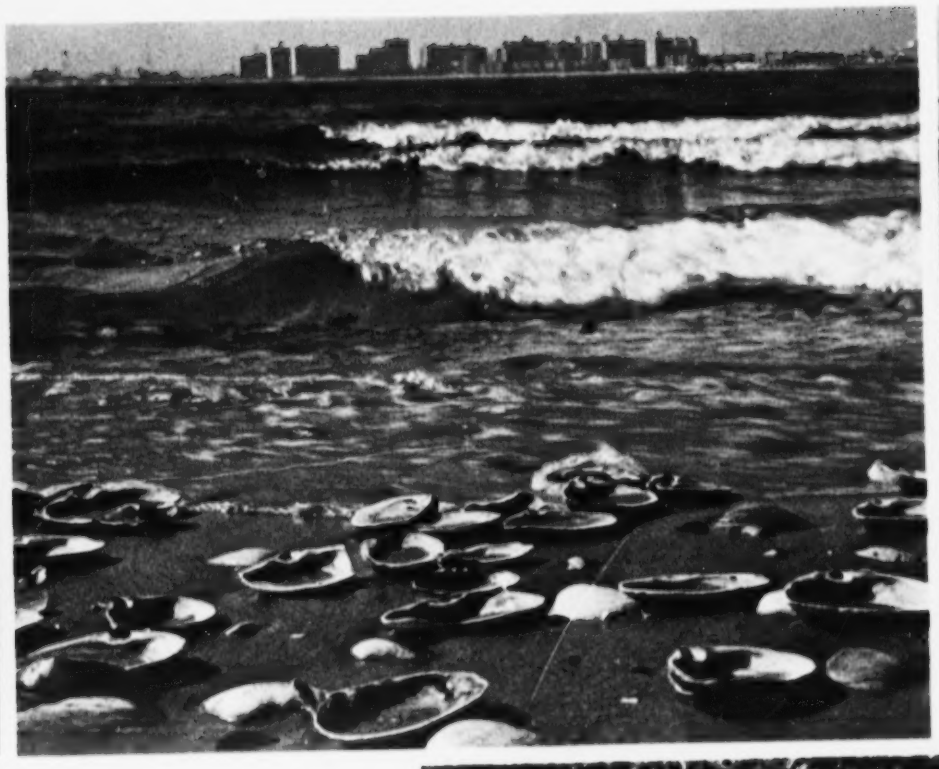
More than 33 million people live within 250 miles of this section of the river. The population of the area is

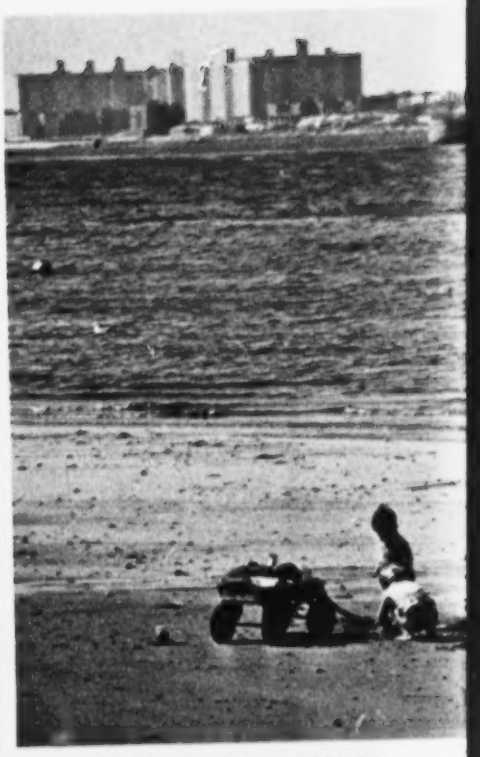
expected to increase to 55 million by the year 2000. The urban related portions of the river should be given highest priority for recreation development.

The *Santa Monica Mountains,* extending some 40 miles due east of the Santa Monica Bay area into the heart of Los Angeles. Here is a total area of about 202,000 acres. Some 59,000 acres are in the city of Los Angeles, 85,000 in Los Angeles County and 58,000 in Ventura County.

The beaches along Santa Monica Bay are among the most intensively used in the Nation. The Santa Monica Range, together with the adjoining beaches, form untapped resources in one of the largest metropolitan areas of our country.

Some 10 miles of *Lake Michigan Beach frontage* that could provide excellent recreation for large numbers of people in the Chicago-Milwaukee area. Approximately





The recreation needs of urban areas, where two-thirds of our people live, are among the most immediate. Here, out-of-doors opportunities are far from adequate. This presents us with a great challenge: We must make the park experience available to people who may never have an opportunity to visit a Yosemite or Yellowstone.

7 million people live within a 60- to 90-minute drive of the area. Beach widths range from 165 feet in Illinois Beach State Park to as little as 50 feet north of Camp Logan.

The *Lake Erie shoreline in the Detroit-Toledo area*, that could provide recreation opportunities for 5 million people. The lands are relatively flat, with a substantial portion classified as wet lowlands. The area is easily accessible via Interstate Highway 75 and Telegraph Road.

In *Huck Finn country* near the Memphis metropolitan area, land and water on the Mississippi are available for development in a stretch running 20 miles upstream and approximately 25 miles downstream from Memphis.

The area is rich in history, legend, horseshoe lakes, dismal sloughs, sunlit sandbars and islands—all tied together by the river. Intensive recreation use could characterize areas within walking distance of densely populated sections of the city. As distances increase from the city center, wilder and more extensive activities, such as hunting, fishing, boating and camping, could take over.

Money to acquire and develop the new areas would come from the Land and Water Conservation Fund.

Since its creation in 1965, the Land and Water Conservation Fund has financed thousands of grants to States and local governments for a broad variety of outdoor recreation projects to make leisure more meaningful to millions of Americans.

During that time States and their cities, counties and school districts have received $317 million from the Fund. That money, matched by an equal amount from the States, resulted in the addition of more than 600,000 acres of lands and waters for recreational use and in the develop-

Land and Water Conservation Fund
State and Local Acquisition Projects
January 1965 to January 1970
675,000 Acres Acquired
Distribution by Activity

	Percent
Hunting	28
Nature Interpretation	21
Fishing	10
Family Campgrounds	9
Picnic Grounds	7
Beaches	7
Boating	4
Trails	4
Sports and Playfields	3
Group Campgrounds	2
Historical/Cultural	2
Park Support	2
Golf Courses	1

The Land and Water Conservation Fund provides money for land acquisition and for recreation development.

ment of many outdoor areas and facilities. More than 5,700 recreation projects materialized through the Fund.

The Fund's wide impact is shown through the addition or improvement of dozens of parks and recreation areas, swimming pools, campgrounds, picnic areas, playfields, beaches, boating facilities, hunting and fishing areas, trails, nature centers, golf courses and winter sports facilities.

At the request of President Nixon, Congress in 1970 amended the Land and Water Conservation Fund Act to increase the amount of money available from the Fund and to transfer surplus Federal property to States and localities without charge.

Beginning with fiscal year 1971, the Fund had an available appropriation of $300 million annually, instead of the previous $200 million.

To help States, cities and counties expand their open space opportunities, surplus Federal property now may be transferred to them for park and recreation use at up to a 100 percent discount. Previously, surplus Federal property could be transferred to States for park and recreation use only at 50 percent of the fair market value.

The change is expected to add significantly to the Nation's park and recreation base. Under the old law, many cities could not find sufficient money to pay 50 percent of the fair market value of surplus Federal property.

The change also puts recreation and park lands on a par with other programs involving disposal of surplus lands. Such lands already were available at a 100 percent discount for public health, housing and airport development.

Much of the increase in Land and Water Conservation Fund appropriations will go for needed recreation facilities in crowded urban centers. Some of the money will assist Interior's new program under which cities set aside streets

Land and Water Conservation Fund
State and Local Development Projects
January 1965 to January 1970
$183 Million Distributed As Follows

	Percent
Supporting Facilities	47
Swimming Pools	10
Sports and Playfields	9
Family Campgrounds	8
Picnic Grounds	7
Beaches	5
Boating	4
Golf Courses	3
Fishing	2
Group Campgrounds	1
Winter Sports	1
Trails	1
Historical/Cultural	1
Nature	1

in heavily populated, low-income areas as "greenbelt" play and relaxation areas closed to traffic.

In addition to aiding States, the Land and Water Conservation Fund has helped the Federal Government acquire numerous national parks, recreation areas and seashores, and more are being acquired.

From 1965 to 1971, Congress appropriated $471 million from the Fund to enable the National Park Service, Forest Service, and Bureau of Sport Fisheries and Wildlife to acquire 700,000 acres of lands and waters for recreation and related purposes.

The giant redwoods in northern California—the oldest living things on earth—are being saved by money from the Fund. Congress established Redwood National Park and BOR was assigned to negotiate the purchase of approximately 23,000 acres of prime timberland from four companies that own the land.

Other national recreation lands and waters that are being acquired through the Fund for public recreation and related purposes include Assateague Island National Seashore in Maryland and Virginia; Point Reyes National Seashore in California; Delaware Water Gap National Recreation Area in Pennsylvania; Biscayne National Monument in Florida; Pictured Rocks National Lakeshore in Michigan; North Cascades National Park in Washington; Guadalupe Mountain National Park in Texas; Mt. Rogers National Recreation Area in Virginia; Fire Island National Seashore in New York; Indiana Dunes National Lakeshore in Indiana; and Mason Neck National Wildlife Refuge in Virginia.

Ninety percent of new national lands and waters acquired for recreation purposes are within three hours driving time of heavily populated areas. Thus, the areas have particular significance for people living in the cities who are in great need of more nearby outdoor opportunities.

America's rivers are imbedded deeply in the Nation's history. Many have been harnessed for power. Others are used for water supply and navigation. Only a few have been set aside for recreation. The situation promises to change greatly in the next few years.

A study initiated by the Bureau of Outdoor Recreation ultimately led to approval by Congress of a law that established a National Wild and Scenic Rivers System.

That law will help preserve our great river heritage. In it, Congress declared portions of eight rivers as original components of the National Wild and Scenic Rivers System. They are the Clearwater and Salmon in Idaho, Eleven Point in Missouri, Feather in California, Rio Grande in New Mexico, Rogue in Oregon, St. Croix in Minnesota and Wisconsin, and Wolf in Wisconsin.

Twenty-seven other rivers were listed by Congress for possible inclusion in the national system. BOR and the Forest Service are studying those rivers and recommendations concerning all of them are scheduled to go to Congress by 1973.

States also may request the free-flowing streams they administer be admitted to the National Wild and Scenic Rivers System through application to the Secretary of the Interior. BOR provides assistance that helps States develop programs to qualify their rivers for admission to the national system.

The first State-administered river added to the National system was Maine's Allagash Wilderness Waterway, which was dedicated July 19, 1970. Beginning deep in Maine's northern woods, the Allagash flows north 95 miles through rugged forests of spruce and birch, providing a unique wilderness experience for canoeists and campers. Half the money needed to acquire lands along the Allagash ($1.5 million) came from the Land and Water Conservation Fund; a matching amount came from the State of Maine.

As it acted to preserve wild and scenic rivers, Congress also responded affirmatively to a call to protect historic trails and to provide the means for developing regional, State and local trails.

The action came from a study led by the Bureau of Outdoor Recreation that recommended a nationwide trails program. Trails have played a vital part in America's survival and development. Today they are needed for many types of recreation—walking, hiking, bicycling, horseback riding and motorcycling.

Two trails—the Appalachian Trail in the East and the Pacific Crest Trail in the West—were established by Congress as the first National Scenic Trails in the new system. Such trails are authorized only by Act of Congress.

Congress designated 14 other routes which BOR and other Federal agencies are studying for possible inclusion in the National Trails System.

Highways, too, come under the purview of BOR. Under the law creating the Department of Transportation, BOR is called upon to review plans from the environment angle. It also reviews Federal proposals under the National Environmental Policy Act.

In carrying out its assignment under the Transportation Act, BOR is guided by the principle that needless encroachment by highways and airports on parks, wildlife and recreation areas cannot be tolerated.

To advance its precept that the conservation of man and his environment is a paramount national objective, BOR has weighed the possible adverse effects more than 200 proposed highways, bridges, railroads and airports would have on resource conservation and environmental values.

Through these efforts numerous "conservation saves" were scored, the best known of which probably was the proposed international jetport near Miami that would have seriously damaged the irreplaceable Everglades National Park.

In a controversy involving Raleigh-Durham Airport and Umstead State Park in North Carolina, BOR efforts brought an agreement that new alternatives would be sought before any action is taken that might damage Umstead State Park.

BOR assisted local interests in obtaining a redesign of Interstate 10 across Blind River, Louisiana, to obtain a 30-foot bridge clearance to accommodate passage of recreation boats.

BOR has made agreements for State Highway Departments to review Land and Water Conservation Fund grant applications to see if proposed highways would affect planned park and recreation areas. The arrangement has proved effective.

State review of Fund applications has shown that a number ot proposed highways would have adversely affected parklands. In those instances, highway routes were altered to protect recreation resources.

In Atlanta, BOR brought metropolitan and State officials together to consider local recreation needs. Following that meeting, a grant from the Land and Water Conservation Fund was approved for 11 parks in the low-income section of a model city area.

In 1970, BOR cooperated with the Labor Department and the President's Council on Youth Opportunity to put

A local community establishes a bicycle path.

$15 million into more than 100 of the Nation's largest cities for summer recreation programs.

Cities used the money to extend a number of their programs that provide recreation opportunities for children from low-income families. Special enrichment programs were inaugurated in a number of the cities with the aid of summer recreation funds.

BOR serves as the lead agency in recreation planning of 24 comprehensive river basin studies directed by the Water Resources Council. In that capacity, the Bureau coordinates and directs all Federal and State agencies concerned with outdoor recreation aspects of water resource planning.

BOR assists the U.S. Army Corps of Engineers by screening applications for navigation permits to identify proposals that might have an adverse effect on outdoor recreation resources. This coordination has resulted in a number of permits being issued specifying modifications to safeguard environmental quality and public recreation values.

In these many ways the Bureau of Outdoor Recreation supplements the special missions of its sister agencies within the Department of the Interior. It has a most particular affinity with the National Park Service, for both are striving to make the land a thing for people to enjoy.

To flourish, sequoia seedlings need sun, moisture and freedom from competing plants.

Parks for People And All Living Things

In 1970, the year a large public adopted "environment" and "ecology" as rallying cries for commitment, the National Park Service simply deepened and intensified a mission that is more than half a century old.

The original purpose of the Service was mainly one of "preserving" the basic integrity of the various land areas within the park system. In recent years, growing throngs of appreciative visitors have placed strains on the natural environment, challenging the ingenuity of the agency. To serve more and more complex human needs while continuing to preserve the quality of the park ...ls has become an added major concern of the Service.

National Park system areas fall into three categories—natural, historic and recreational—with a separate administrative policy to suit each type. Each category has received its own special version of the "new look" in environmental management, tailored to the Park Service's public mission and to the new information and insights that ecological wisdom dictates.

In natural areas, management, until recently, was concerned primarily with protection. In recent years, this concept has given way to management based on the ecology of the natural area—the interactions of its organisms with each other and with their environment.

A dramatic example of the way the ecosystem concept has affected natural area management is the case of the giant sequoias. In three great national parks—Sequoia, Kings Canyon and Yosemite—sequoias had been given every possible protection from fire. As a result, undesirable growth also flourished. A thick mat of underbrush had grown up, out of which the crowns of white fir and incense cedar reached the lower branches of the sequoias. Fire, which once had raced regularly through the light vegetation at the base of the sequoias and cleared the undergrowth, now posed a real threat to the mighty giants.

Ecological studies further established that sequoia seedlings must have full sunlight, adequate moisture and relative freedom from competing plants during their early life. The periodic fires set by lightning, and natural openings in the woods and cleared areas caused by wind-thrown or snow-laden trees, combined to offer the conditions necessary for the sequoia to carry on its fight for survival in the competitive plant world. Fire protection was choking the baby sequoias to death.

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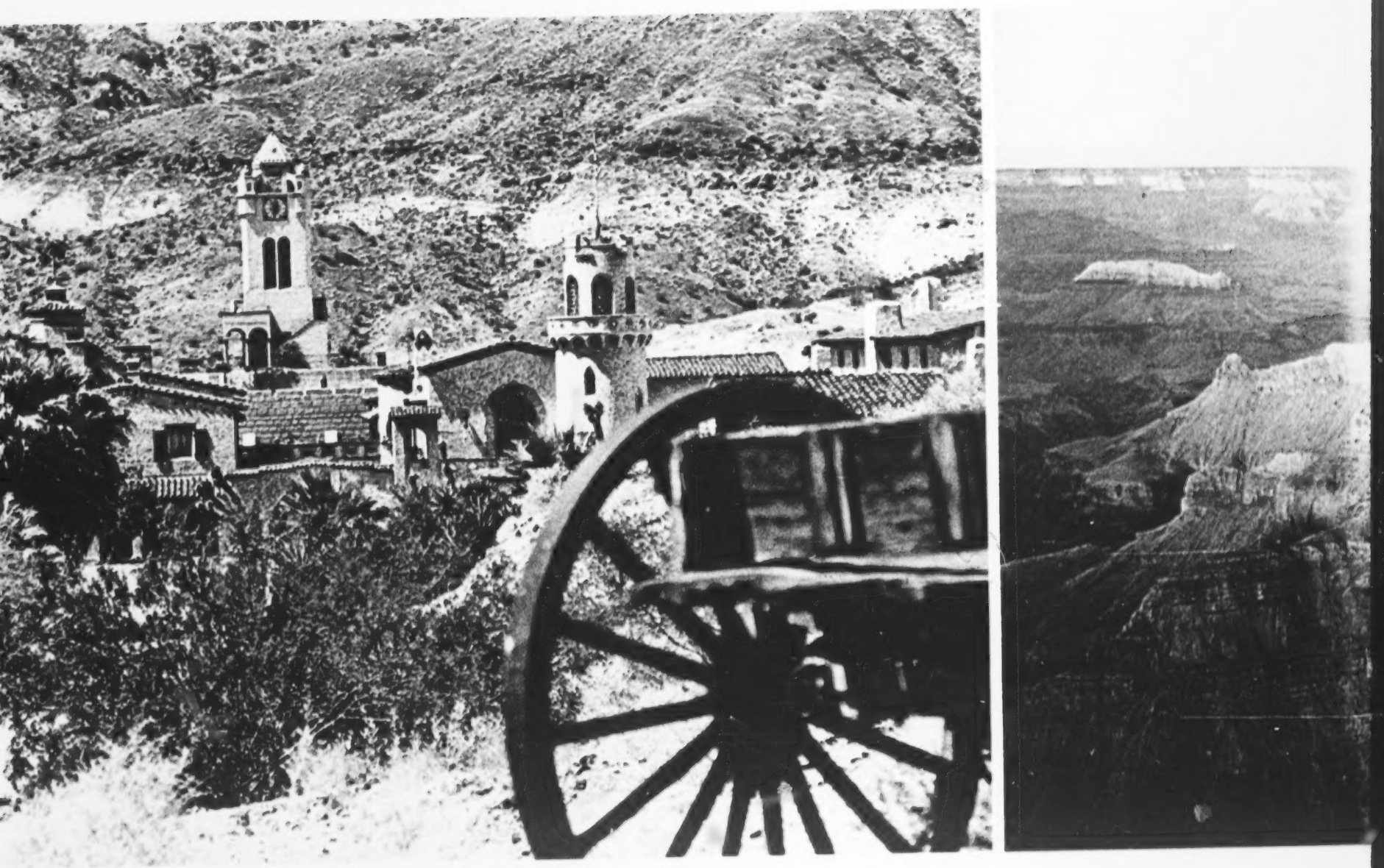

New signs (far right) will ease exploration of historic sites and natural wonders.

The National Park Service is now engaged in an extensive effort to restore the groves to something like their pristine condition. This involves removal of the understory and elimination of ground litter. Natural fires then can be allowed to creep through the groves as they did before European man came on the scene or prescription burning may be used for better control in managing the groves. Then the stately trees, whose bark, once it is well-formed, is quite fire resistant, will again present the visitor with clear, cathedral-like vistas, their towering trunks forming natural patterns of distribution, and the forest floor sheltering an abundance of all the wildlife species which formerly inhabited the groves.

Technological as well as natural hazards must sometimes be taken into account in the environmental management of the national parks. For example, man-made changes of the Florida environment could endanger Biscayne Bay, which constitutes most of Biscayne National Monument. A nuclear powerplant that would use huge volumes of water from Biscayne Bay for once-through cooling, threatens survival of the marine biota by raising the temperature of the water in which they live. The Justice Department, at the behest of the Department of the Interior, is seeking to require the power company to halt the thermal pollution caused by discharge of heated water into the bay from two fossil fuel units now in operation; and to provide protection against pollution from the nuclear powerplant under construction.

A long-standing threat to park environments now receiving remedial attention is that posed by inholdings—patches of land within parks where private ownership can result in conditions incompatible with overall park quality. Accelerated land acquisition, in both new areas and inholdings within the older areas, was made possible under the 1968 amendment to the Land and Water Conservation Fund.

As a result, in 1970, the Park Service neared completion of the acquisition phase of such areas as Assateague Island National Seashore, Ozark National Scenic Riverways, Whiskeytown National Recreation Area and Pictured Rocks National Lakeshore. The "opportunity purchase" program permitted rapid action to acquire 28,420 acres of privately owned land within park areas in the fiscal year ending June 30, 1970. Included was Death Valley Scotty's Castle and 1,620 acres of underdeveloped land lying within Death Valley Monument in California.

Also avoided by judicious use of acquisition funds were an adverse development at the Nation's first National Monument—Devil's Tower in Wyoming; a logging threat at Olympic National Park, and two junkyards at Rocky

48 GP

Mountain National Park. In many cases these purchases opened to public enjoyment areas that had been hidden behind "No Trespassing" signs.

The new acquisition tools for improved environmental management now available to the Park Service are: (1) Perfection of sellback-leaseback procedures whereby land is purchased and then resold or leased to the original owner or to another, subject to restrictions designed to preserve scenic or other values; (2) Scenic easement estates, requiring the owner to restrict use and development of his lands primarily with regard to future rather than existing use; (3) The land acquisition zone concept—a system that permits private uses while protecting natural endowments and providing for public needs.

Wilderness studies will continue to accelerate to meet the 10-year deadline established in the Wilderness Act of 1964. The Service plans completion of 57 eligible area reviews by 1974, and three involving newly acquired areas thereafter.

Some innovative headway against the mounting environmental problem of transportation within the National Park System was made in 1970, as the ad hoc committee on road planning and uses continued its surveillance of the System's roads. The committee includes landscape architects, ecologists and interpretive planners.

This committee of multi-disciplinary environment experts reviews each road project with a sensitive eye to the environment. In addition to overseeing such proposed roads as the new ones at Delaware Water Gap and Assateague Island, and major reconstruction projects like those at Lake Mead, the Dune Crossings at Fire Island and the North Entrance Road at Grand Canyon, the committee approved a five-mile scenic bus system at Mariposa Grove in Yosemite. Autos now park below the grove of Big Trees and all access is by bus. A free scenic bus system implemented in July 1970, provides access to Mirror Lake and Happy Isles and helps relieve the vehicle pressures at Yosemite, putting people ahead of cars in the priority list.

Several studies have been made for specific areas proposing alternate transportation to the automobile. These studies are part of the master plan awaiting review, approval and funding. One of these would substitute arterial water transportation at Lake Ross in the North Cascades for a very costly and destructive road system.

The Joint Committee, Canada-United States National Parks, has published a planning guide, *Transportation: National Parks*, covering the broad fields of transportation planning.

Maximum usefulness to people with minimum adverse impact on the environment is the goal of the park road system, and the new NPS sign system is a major step toward this desirable set of twin goals.

Launched in 1970, the new system substitutes symbols for words to convey instructions. The enthusiastic acceptance with which the signs have been received by other U.S. Government agencies and by the International Commission for Breaking the Language Barriers presages multinational use of the NPS sign system.

Overcrowding and overuse of campsites have damaged and destroyed natural features within parks, demeaned the experience of the park visitor and placed a heavy strain on the limited manpower available. Critical articles in the Nation's press have denounced "wall-to-wall" tenting in such popular parks as Yosemite, Yellowstone, Great Smoky Mountains and Grand Teton. But so popular has camping become that the same crowded conditions have spread to lesser-known areas, bringing traffic jams, environmental pollution and ecological problems.

In the past seven years, visitation to National Park System areas increased nearly 68 percent—from 103 million in 1963 to 172 million in 1970—while permanent NPS employees increased by only 13 percent.

In order for national park camping to continue as a quality experience, the number of campers is now limited to the carrying capacity of the campgrounds. Overflow along roadsides and in undesignated areas has been discontinued, and most campgrounds within the system are operated by the Park Service.

Joint regional planning in the vicinity of national park areas has been stimulated by Federal grants from agencies such as Housing and Urban Development, with emphasis

(Continued on page 50)

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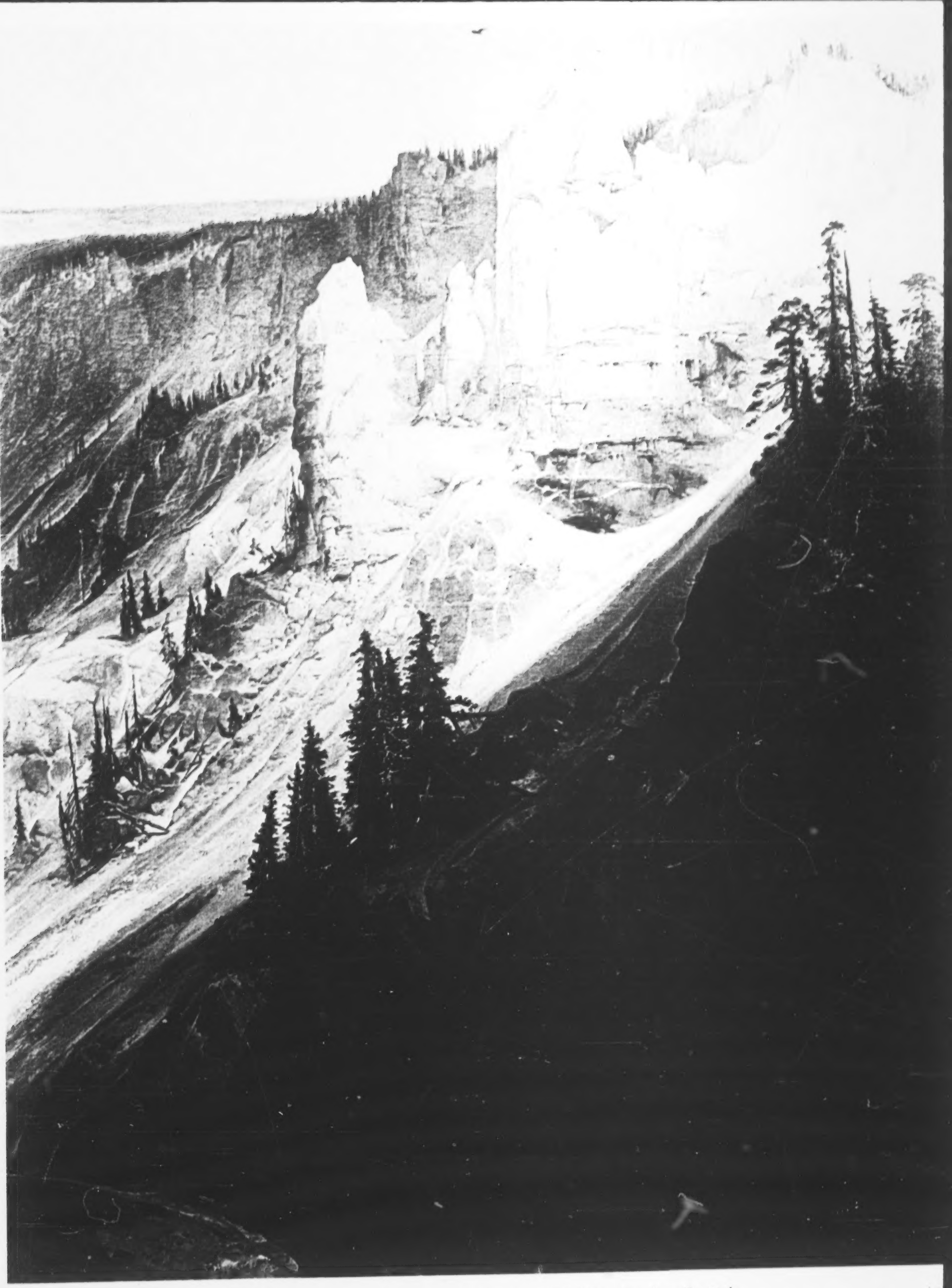
In 1871, Thomas Moran, an artist, accompanied a U.S. Geological Survey team into the area no known as Yellowstone National Park. This trip inspired "The Grand Canyon of the Yellowstone



Later, Congress purchased the painting and arranged for its exhibition in the Capitol. Yellowstone, this country's first national park, will celebrate its 100th anniversary in 1972.

on the total nature of the environment—both the park itself and the setting in which it lies.

Far too often, crassly commercial developments downgrade the parks they surround. Strong efforts are being made in a number of areas to reverse such conditions.

The "gateway" concept seeks to extend the park's quality to the surrounding environment, rather than allowing sleazy fringe development to encircle and demean the park's island of quality. Joint regional planning on the part of all concerned government officials and key elements of the private sector is helping accomplish this objective.

In addition to scenic and recreational areas, the National Park system has a cultural phase of the environment to administer—from the archeological areas that preserve relics of prehistoric civilizations to the battlefields, documents, buildings and historic sites that are marks of our own cultural development.

In accordance with a Secretarial directive to identify gaps in the historic and natural history representation within the park system, a special task force was assigned. In their reports, task force members modified and refined the existing theme structure within which historic properties have been evaluated.

The year saw intensified activity among States and municipalities as well as Federal moves to broaden the National Registry of Historic Places. Addition of 319 properties brought the total entries to 1,100.

NPS grants totaling $969,000 to the National Trust for Historic Preservation, 35 States, and Puerto Rico, helped survey and preserve National Register properties in 1970.

The Advisory Council on Historic Preservation has been successful in saving many a threatened building and site. The decision to reroute the expressway menacing the Vieux Carre of New Orleans was a dramatic illustration of the Council's effectiveness in solving preservation problems.

The cultural facet of our environment is made up of what man has built or preserved of himself. Man's immediate environment is always man-made, whether it be a hut in the forest or a great, shining city. As this environment grows and changes, its cultural ecology must be kept in balance—the evidences of the past preserved to explain and enrich the present. Otherwise, asks the National Park Service, "How will we know we're us?"

Environmental education may begin with a fascination for a small part of the natural world—a flower, a blade of grass, a piece of rock, a leaf from a tree. It can lead to an appreciation of the delicate balance of nature.

New Life from the Land

Through study, work and example, the Job Corps Civilian Conservation Centers provide an ideal opportunity to involve youth in the quest for environmental quality—and the quest for an image of self.

The purpose of Job Corps Programs, whether conducted in the city by the Department of Labor or in rural areas by the Departments of the Interior and Agriculture, is to give America's disadvantaged youth an opportunity to make a fresh start in life. The program provides for developing new social skills, gaining vocational training and work experience, and for developing a genuine concern for the environment in which the Corpsmen live and of which they are an integral part.

At the Interior Job Corps Centers, administered by the Bureau of Sport Fisheries and Wildlife, the Bureau of Indian Affairs, the National Park Service and the Bureau of Reclamation, the volunteer enrollee improves his ability to read, write and work with numbers. Under the tutelage of union craftsmen, he also learns vocational skills and gains on-the-job experience in carpentry, masonry, painting, automotive mechanics, cooking, heavy equipment operation, welding and printing, among others.

Working and living in the outdoors, close to nature, often brings a change in the Corpsman's outlook and philosophy of life, as well as improvements in his health. Here he may use his job skills to make improvements in the environment. His work may include correcting streamflows, stabilizing waterways, building visitor facilities, or putting parks and campgrounds into shape.

Whatever his job, he gets training and actual work experience at the same time that he makes his unique contribution to preserving the land heritage.

However, actual production, in terms of conservation work accomplished, is only incidental to the success of a program geared primarily to conserving and strengthening

the Nation's human resources. Nevertheless, since the beginning of the program in 1965, the incidental conservation work produced by the Job Corpsmen in areas administered by the Department of the Interior has been appraised at $37.3 million.

Thus the Job Corpsman contributes to the capital assets of the Nation. In turn, the Nation is acquiring a cadre of environmentally aware American youth.

Nature in the Classroom And Classes Out-of-Doors

Environmental awareness is an instinct that has been blunted in man by the complex demands of modern society. Rehoning this instinct—renewing the appreciation of nature's delicate check and balance system—underlies the purpose of most of Interior's activities.

Environmental education is more a growth process than a science discipline—a learning situation in which students are made aware of the interactions of living things, thus giving them an ecological awareness they may interpret in daily living.

The classroom and the outdoors both offer settings for this kind of learning. The Department of the Interior is developing study guides for both areas.

Three separate but related activities of the National Park Service are spreading the awareness message outward. They are the National Environmental Education Development (NEED), the National Environmental Study Area (NESA) and the National Environmental Education Landmark (NEEL) programs.

NEED is a curriculum-integrated set of educational materials, developed on contract for the National Park Service and paid for by the National Park Foundation. The NEED program eventually will cover kindergarten through high school. By the fall of 1970, it had been developed for third through eighth grades and tested on some 30,000 youngsters in selected schools across the Nation, representing a wide range of economic and cultural backgrounds.

NESA began as environmental study area sites set aside within existing national parks for use by children in nearby schools. The program was designed to fit into established curricula and was a cooperative venture between the National Park Service and local educators.

In 1970, it became departmentwide, involving all Interior agencies with land management responsibilities—including the National Park Service and the Bureaus of Reclamation, Sport Fisheries and Wildlife, and Land Management—and drawing on the communities adjacent to their NESA sites. The NESA program also has been instituted in Interior's Job Corps Civilian Conservation Centers as a means of enriching the existing Job Corps curriculum.

With the autumn 1970 publication of a NESA Guidebook, produced in cooperation with the National Education Association, the NESA network spread rapidly to schools throughout the country. The NESA program is practical and feasible for every school district in America. It is not necessary to be within easy reach of a national park, refuge or other Federal lands. An environmental study area can be established in a local park or in an urban neighborhood. However, the site must lend itself to interpreting man's relationship to his environment; must be "sturdy" enough to maintain its environmental integrity without impairment through usage; and must be located and equipped conveniently for regular use by area schools.

A National Environmental Education Landmark is a study area where the environmental and ecological integrity, the facilities and the on-going program are of such quality as to merit special recognition. NEEL is part of the National Park Service Landmark program, and a strict set of criteria must be met and adhered to in order for landmark status to be conferred or to continue. NEELs may be primarily cultural or natural, but in either case must be of outstanding significance.

Another aspect of environmental education was developed in the Bureau of Outdoor Recreation. With three-fourths of America's school population living in urban areas, BOR saw little chance for students to learn about the environment from nature's own classroom, the primitive outdoors. Therefore, BOR has developed a program that brings nature indoors.

Miniature Environments—An Environmental Education Guide Book was published by BOR and started a trend in educational thought. It describes simple methods for building miniature environments, using low-cost materials and equipment. The guide enables students to examine the behavior of plants and animals under natural conditions. The need for proper temperature and humidity and the significance of light in plant growth and animal behavior are made clearly visible. By introducing manmade changes in the combination of air, water and land, students can watch nature react, see how living things perform and witness the miraculous way in which nature's self-correcting mechanisms restore balance to the environment.

The Bureau of Sport Fisheries and Wildlife (BSFW) is taking another tack in promoting environmental awareness. BSFW's North Central regional office has begun working with the Environmental Science Center (ESC), an educational research group in Minneapolis-St. Paul, to develop environmental education techniques which can be used by teachers and students, from kindergarten through high school, in classrooms and outdoors. The materials are designed to teach an understanding of basic environmental relationships occurring in natural outdoor areas, and are designed to help the educational system use the tremendous variety of ecosystems occurring on the millions of acres of lands and waters managed throughout the United States by BSFW and other resource agencies.

The out-of-doors is a model classroom. Children are innately curious about their surroundings and enjoy learning by observing.

The work with ESC also includes intensive training programs for Bureau personnel and for teachers from communities adjacent to national wildlife refuges, wetlands areas and Federal fish hatcheries.

These efforts are being concentrated in areas where no statewide environmental education program now exists, and in States where the education department and the legislature have indicated support and cooperation.

BSFW has an agreement with Southern Illinois University involving a wide range of environmental education activities for youth and potential teachers on 1,200 acres of Crab Orchard National Wildlife Refuge in Illinois. Not only does the Bureau provide land, but it assigns personnel to help plan programs.

The agency has been studying the part its national wildlife refuges and fish hatcheries can play in the field of environmental education for urban masses. With more than 80 refuges within 20 miles of major urban areas, BSFW recognizes its great opportunity to make available both natural and managed areas for study in elementary schools, colleges and youth organizations. The Bureau hopes to establish "ecological classrooms" (outdoor study areas) on several refuges across the country.

Through BSFW's urban fishing program, thousands of city youngsters had their first angling experience in the summer of 1970. Geared largely to disadvantaged urban youth, programs in Atlanta, St. Louis, Boston, Newark, Portland and Washington continued throughout the school vacation season.

Success of the programs depends largely upon cooperation of local citizens, State wildlife agencies and city recreation departments. BSFW supplies technical assistance, catchable fish for stocking and helps with an environmental instruction program. Cooperators supply transportation, lunch and supervision. Species produced at national fish hatcheries are used in the programs.

BSFW led other Interior agencies in environmental teach-in participation during Earth Day observances in April 1970. Employees participated in 469 events before 133,000 persons. The figures do not include the thousands of persons who viewed films which were borrowed from regional offices or field stations and shown by private individuals.

Other Interior agencies also participated in Earth Day, as, for example, the Park Service which was involved in 400 events.

On August 13, 1970, President Nixon signed into law a bill authorizing the Interior and Agriculture Departments to establish a Youth Conservation Corps. Through this program, about 2,200 young men and women, ages 15 through 18, from all economic and social backgrounds, will take part in conservation work on public lands in summer 1971.

The goal of the YCC is threefold: 1) To improve the quality of our public lands and waters through conservation work; 2) to provide gainful summer employment for the Nation's youth; and 3) to build up a reserve of environmentally trained young citizens, knowledgeable of their country's irreplaceable heritage of natural and historic resources, and of their own place in the ecological system.

The Office of Water Resources Research also adds to the sum total of environmental awareness among American youth. In recent years, nearly 2,000 students have received financial aid while serving as research assistants to principal investigators working on projects supported by OWRR. Numbers of them have moved into professional jobs in the adventurous field of water resources research.

In the summer of 1970, the Bureau of Indian Affairs added its voice to the chorus of environmental education advocates. Indian awareness of the natural environment is part of the tribal tradition. For hundreds of years, Indians have viewed themselves as an integral part of the dynamics of nature, accountable to the natural forces, and therefore have been unwilling to abuse or drastically alter the environment.

BIA has asked schools serving Indian children to make a special effort to assure that a concern for the environment remains alive in the Indian heritage. Students, teachers, parents and other adults in Indian communities are learning to relate environmental studies to studies in Indian culture, thus bringing into the classroom a philosophy that formerly endured only as elders taught children by example.

Environmental education at its best can be an extension of the natural tendency of children to explore all things around them. To help them interpret the cause-and-effect relationships of all they see is the essence of guided study, both in the classroom and in the outdoor study areas.

Vital messages are being told by nature—and nowhere more poignantly than in the wildlife world.

Guarding the Land's Fragile Creatures

Because fish and wildlife are key indicators of pollution—often their condition providing the first hint of environmental deterioration—the Bureau of Sport Fisheries and Wildlife (BSFW) has a crucial role in meeting America's ecological challenge.

Former employee and noted author Rachel Carson ushered in what has been described as the "age of ecology" by warning of the pesticide danger before most people realized their own existence was threatened by this hazard. Many other contaminants have since been discovered and are causing alarm, for Homo sapiens has come belatedly to realize that a planet unfit for wildlife will be unfit for man. Wild things, therefore, serve as an early warning system in man's environmental defense.

For several years, the Bureau has been monitoring the effects of several kinds of pollutants on fish and wildlife. These programs will be continued in the 1970's with a new sense of urgency. The Bureau is expanding its mercury research program on a crash basis with recent discovery of this dangerous substance in waterfowl—in all 26 ducks taken as samples from North Dakota and Michigan's Detroit River-Lake St. Clair area.

A major source of mercury contamination for waterfowl, Bureau authorities believe, may be treated seeds. Seed manufacturers have used mercurial compounds for years to protect vegetable grain and fruit seeds from fungi.

Lake St. Clair is believed to be one of the most mercury-polluted areas in the country. It was there that the mercury crisis exploded in March 1970, when large doses of the heavy metal were found in fish.

Bureau biologists stress that not enough research has been done at this time to know how menacing mercury is to waterfowl. Scientists at the Bureau's Patuxent Wildlife Research Center in Laurel, Maryland, have implicated mercury, however, as a cause of death in America's national bird, the bald eagle.

Four of these birds examined in a new mercury testing program at the Center contained residues of this heavy metal—two from Minnesota had lethal amounts in the kidneys.

Because of this alarming discovery, in the future all bald eagles examined at Patuxent will be tested for mercury. Most bald eagles found dead in the United States are sent there for study.

Bureau scientists believe the eagles are picking up mercury through the ingestion of fish. Mercury contamination of the Great Lakes is causing serious concern; BSFW is investigating the effects of heavy metals on the fish and wildlife in the Great Lakes and its tributaries. The research effort is centered at the Bureau's newly acquired laboratory in Ann Arbor, Michigan, with personnel at Sandusky, Ohio, playing an important role in sample collection on Lake Erie.

Mercury and other heavy metals are exceedingly persistent in nature, remaining perhaps 50 to 100 years in stream and lake bottoms. Means of removal are still unknown, but the Bureau and other agencies are seeking answers.

America's mercury crisis may be even more critical for many fish-eating animals. In samples from 26 birds of 11 species, seven frogs of two species and three garter-snakes, researchers found that levels in two fish-eaters, great blue herons and common terns, far exceeded those in other species. Lowest residues were in frogs, snakes and sandpipers.

Another environmental menace for birds is the pesticide dieldrin. In June 1970, the Bureau announced that poisoning from dieldrin is being detected in growing numbers of bald eagles found dead in this country.

Other birds clearly are affected by this pesticide. Patuxent Center reports that an osprey found dead in Connecticut had 8 parts per million of dieldrin in the brain—a lethal dose.

In addition, BSFW announced in 1970 that all mallard and black duck wings and all starlings tested in recent years have contained DDT or its metabolites, DDE or DDD. Starlings carried a much heavier concentration, probably reflecting their feeding habits.

The Bureau has been sampling starlings and ducks as part of the National Pesticides Monitoring Program, which also involves research by State and other Federal agencies. BSFW has monitored pesticides in fish at 50 stations in 32 States in recent years as part of the program. DDT and its metabolites were found in all but six of 590 samples examined. Of the samples without DDT, five were in Alaska.

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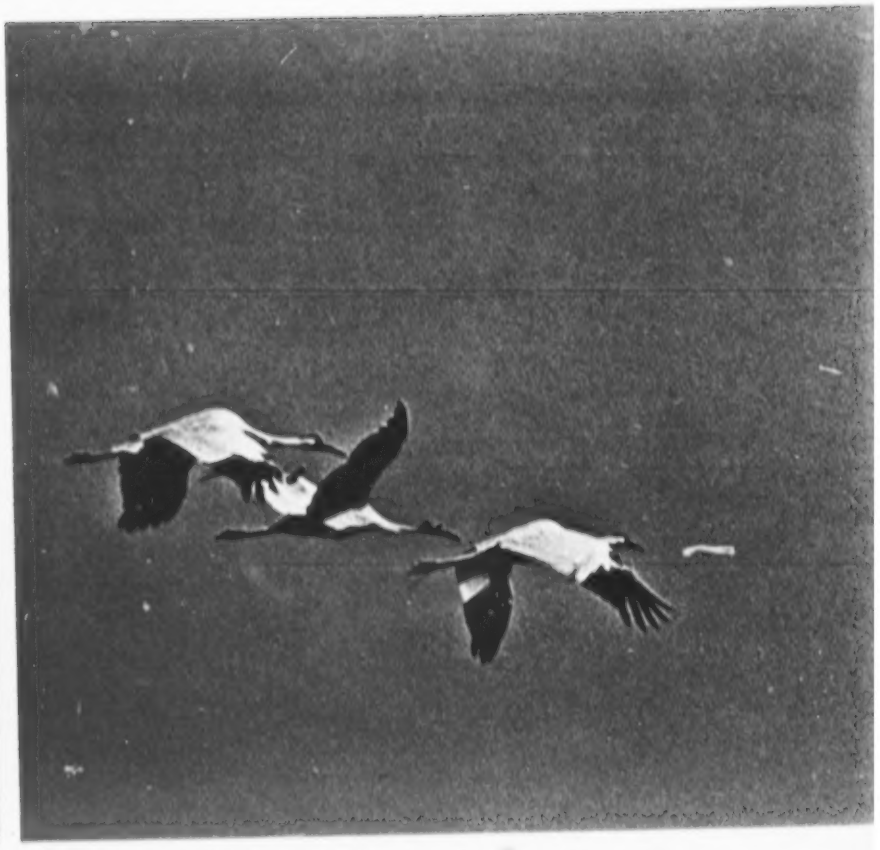


We have belatedly realized that a planet unfit for wildlife will be unfit for man.

Recent research supported by the Office of Water Resources Research (OWRR) has produced other timely data.

For example, research supported by OWRR has produced valuable information particularly relating to concentrations of DDT in Coho salmon in Lake Michigan.

Research by the Michigan Institute at East Lansing showed that large amounts of DDT passed through municipal sewage disposal plants rather than coming from rural areas, as was formerly suspected. The material was further identified as a product of urban spraying of trees for Dutch Elm Disease. This study was instrumental in bringing about a ban on the use of DDT for urban tree and mosquito spraying.

Michigan studies also showed a fresh-water clam ideal for use in the study of pollutants, including DDT. The clam has a great ability to take up and retain materials in its tissues. By placing a number of fresh-water mussels in a screened container at intervals in a stream and then analyzing the tissue, it is possible to detect the presence of insecticides and calculate the relative amounts in the various sections of the stream, and the stream's contribution to the Great Lakes. The Federal Government and the several States adjoining the Great Lakes have agreed upon use of this method for estimating DDT movement and its concentrations.

Research, therefore, has tended to confirm what Miss Carson feared—there could be a silent spring—and the implications for man are ominous.

But man's aroused ecological conscience may turn the tide of environmental degradation, and not solely for the sake of man, but for all living creatures.

The increased interest in environmental problems is evidenced by a growing volume of conservation legislation that will assist all the natural resource agencies in fulfilling their missions. The Endangered Species Conservation Act went into effect in June 1970, under the guardianship of the Bureau of Sport Fisheries and Wildlife.

Under the new law, the Secretary of the Interior will prohibit importation of wildlife species found to be threatened with worldwide extinction. Exceptions may be made for certain scientific and educational purposes or for propagation to preserve the species. The law provides stiff penalties for violators.

Previously, the United States could prevent the importation only of injurious species such as fruit bats, mongooses and walking catfish, or of birds and mammals taken or exported contrary to foreign laws.

Now the Federal Government has authority over all wildlife imports. The statute requires documentary proof that the wildlife imported was legally taken in the country of origin.

To facilitate enforcement, fish and wildlife imports are restricted to eight ports of entry: New York, Miami, Chicago, Los Angeles, San Francisco, Honolulu, New Orleans and Seattle. The Bureau has increased its number of import inspectors and, with the assistance of Bureau of Customs port inspectors, is checking all wildlife imports to assure compliance with the Act.

Domestically, the statute makes it a Federal offense to sell or purchase, in interstate commerce, any reptile, amphibian, mollusk or crustacean taken contrary to State law. These activities already were unlawful for fish, mammals and birds, but this new law will give the Bureau's game management agents authority to seize alligator hides taken by poachers, for example, or lobsters taken illegally in one State and sold in another.

America's national bird, the bald eagle—another victim?

Mercury—the Killer

Mercury, the killer element, has become one of Interior's targets in the battle for a balanced environment. Recent deaths and debilitation among fragile wildlife forms reveal mercury's pervasive destructiveness.

The Bureau also is making significant progress in wetlands preservation. When the "government year" ended June 30, 1970, the Bureau had acquired 42,000 acres, bringing the total of permanent waterfowl production areas under public ownership to more than 200,000 acres. Easements that protect seasonal or temporary wetlands from draining, filling and burning were purchased for about 100,000 acres during the fiscal year, bringing the total to 770,000 acres, mostly in the Dakotas and Minnesota.

For the current year, BSFW has accelerated its efforts in order to reach the 1976 goal of protecting 1.75 million acres of prairie wetlands.

Increased protection is needed to stem loss of wetlands by draining and filling. Without this protection the high northern plains could become a featureless expanse of grass and grain—a tragedy for those who want waterfowl and other wild creatures to remain a part of our environment.

This is the 12th year of the wetlands acquisition program, concentrated in the "duck factory" region of the

Man, too, has been a victim. For 20 centuries mercury has been known as a sometimes deadly medicine. Then, during the 1950's, at least 50 human deaths in Japan were attributed to consumption of mercury-tainted fish from Minamata Bay. Sweden raised the alarm over mercury pollution in the Baltic in the 1960's. Mercury-tainted pork was identified as a killer in Mexico in 1969.

Industry is not the sole cause of all mercury pollution. Nature herself has always contributed traces of mercury to our rocks, streams, lakes and air. All of the world's mercury is derived originally from the rocks of the earth's crust.

But man's use and misuse of mercury is still the greatest source of mercury pollution, especially in urban areas. Within the next 30 years, our use of mercury is expected to double.

Mercury became a commercial metal in this country about the time of the gold and silver rushes of the 1850's and 1860's. Today the United States uses more than 2,500 tons of mercury per year—about 20 percent of the world's total annual production. After use, about one-fourth of this mercury is returned directly to the environment. Mercury compounds used as bacteria killers are flushed down hospital sinks, mercury pesticides and fungicides are washed off farmlands, and mercury wastes are discharged from industrial plants. It's these quantities of discarded mercury that are creating the Interior Department's new concern.

To combat the growing problem of mercury pollution, Interior has developed a three-pronged attack.

The Geological Survey has been refining the technical ability to detect mercury in ever smaller quantities. Analytical methodology capable of detecting commercial mercury deposits is less than 35 years old. In 1970, the Survey perfected the "silver wire" method used to detect concentrations as small as 0.1 parts of mercury in a billion parts of water.

The second prong of Interior's attack is a nationwide reconnaissance to determine the current concentrations of mercury in the Nation's streams and lakes. As part of this reconnaissance, the Survey has begun a sampling of water in the urban areas of all 50 States, the District of Columbia and Puerto Rico. Near each city of 100,000 population or more and near selected smaller cities, Survey hydrologists will sample and analyze water from major streams and lakes. Detection of mercury poisoning in wildlife is also part of the reconnaissance.

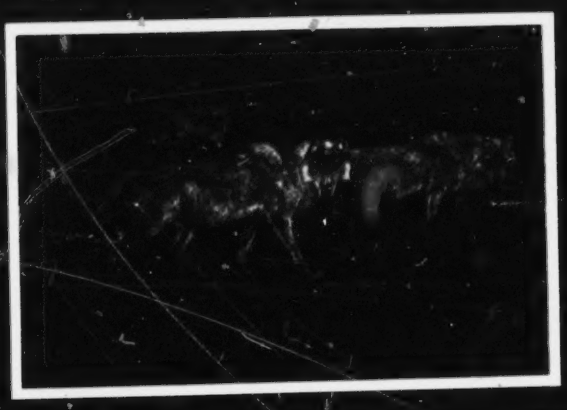
The third prong of the attack is to reduce and prevent mercury pollution. Pressure and legal action have been brought against some 50 industrial polluters. Within two months of first bringing this pressure to bear, 50 industrial plants had already reported to Interior that their mercury discharges into America's waterways had been reduced drastically—from about 287 pounds per day in July 1970, to 40 pounds per day in September in the aggregate.

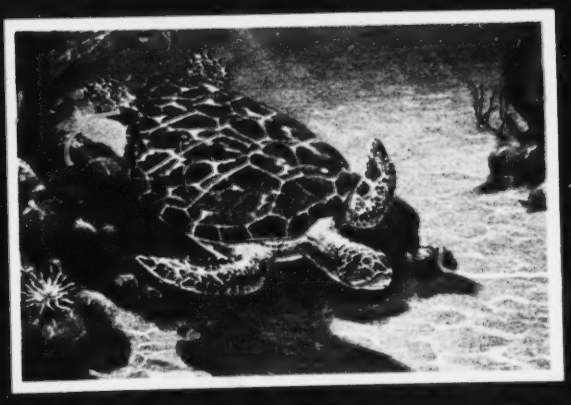
Dakotas, Minnesota, Nebraska and Montana. Each spring, melting snows fill thousands of lakes, marshes and potholes where waterfowl return to feed and rear young.

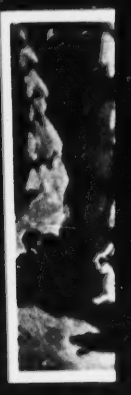
The acquisition program has two parts. Fee purchases protect larger, more permanent wetlands by putting nucleus areas in public ownership. Under the second part of the program, seasonal or temporary wetlands around nucleus areas remain in private ownership, but are protected by purchase of easements under which owners agree not to drain, fill or burn their wetlands.

All such acquisitions are financed through the sale of Federal duck stamps and by the advance made by Congress on future stamp sales. Last year, more than two million of these stamps were sold, the highest figure since 1959, and collections exceeded $6 million.

To provide the country with an early warning system for its environmental ills; to help protect the multitude of wildlife forms that are man's neighbors on this Earth; and thus to reinforce the link between land and life—this is BSFW's mission for the Seventies.







Endangered Species of the United States

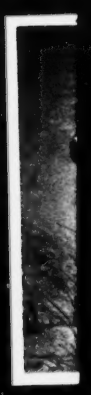
A species is considered endangered when it is so reduced in number or so threatened by loss or change in its habitat that it is in danger of extinction in the wild.

MAMMALS

Hawaiian hoary bat
Indiana bat
Delmarva Peninsula fox squirrel
Morro Bay kangaroo rat
Salt marsh harvest mouse
Eastern timber wolf
Red wolf
San Joaquin kit fox
Black-footed ferret
Florida panther
Florida manatee (sea cow)
Key deer
Columbian white-tailed deer
Sonoran pronghorn

BIRDS

Hawaiian dark-rumped petrel
California least tern
Hawaiian goose (nene)
Aleutian Canada goose
Laysan duck
Hawaiian duck (koloa)
Mexican duck
Brown pelican
California condor
Florida everglade kite (snail kite)
Hawaiian hawk (io)
Southern bald eagle
American peregrine falcon
Arctic peregrine falcon
Attwater's greater prairie chicken
Masked bobwhite
Whooping crane
Yuma clapper rail
California clapper rail
Light-footed clapper rail
Hawaiian gallinule
Hawaiian coot
Eskimo curlew
Hawaiian stilt
Puerto Rican plain pigeon
Puerto Rican parrot
Ivory-billed woodpecker
Red-cockaded woodpecker
Hawaiian crow (alala)
Small Kauai thrush (puaiohi)
Large Kauai thrush
Molokai thrush (Olomau)
Nilhoa milierbird
Kauai oo (oo aa)
Crested honeycreeper (akohekohe
Hawaii akepa (akepa)
Maui akepa (akepuie)
Oahu creeper (alauwahio)
Molokai creeper (kakawahie)



Akiapolaau
Kauai akialoa
Kauai and Maui nukupuus
Laysan and Nihoa finches
Ou
Palila
Maui parrotbill
Bachman's warbler
Kirtland's warbler
Dusky seaside sparrow
Cape Sable sparrow

REPTILES AND AMPHIBIANS

American alligator
Blunt-nosed leopard lizard
San Francisco garter snake
Puerto Rican boa
Santa Cruz long-toed salamander
Texas blind salamander
Houston toad

FISHES

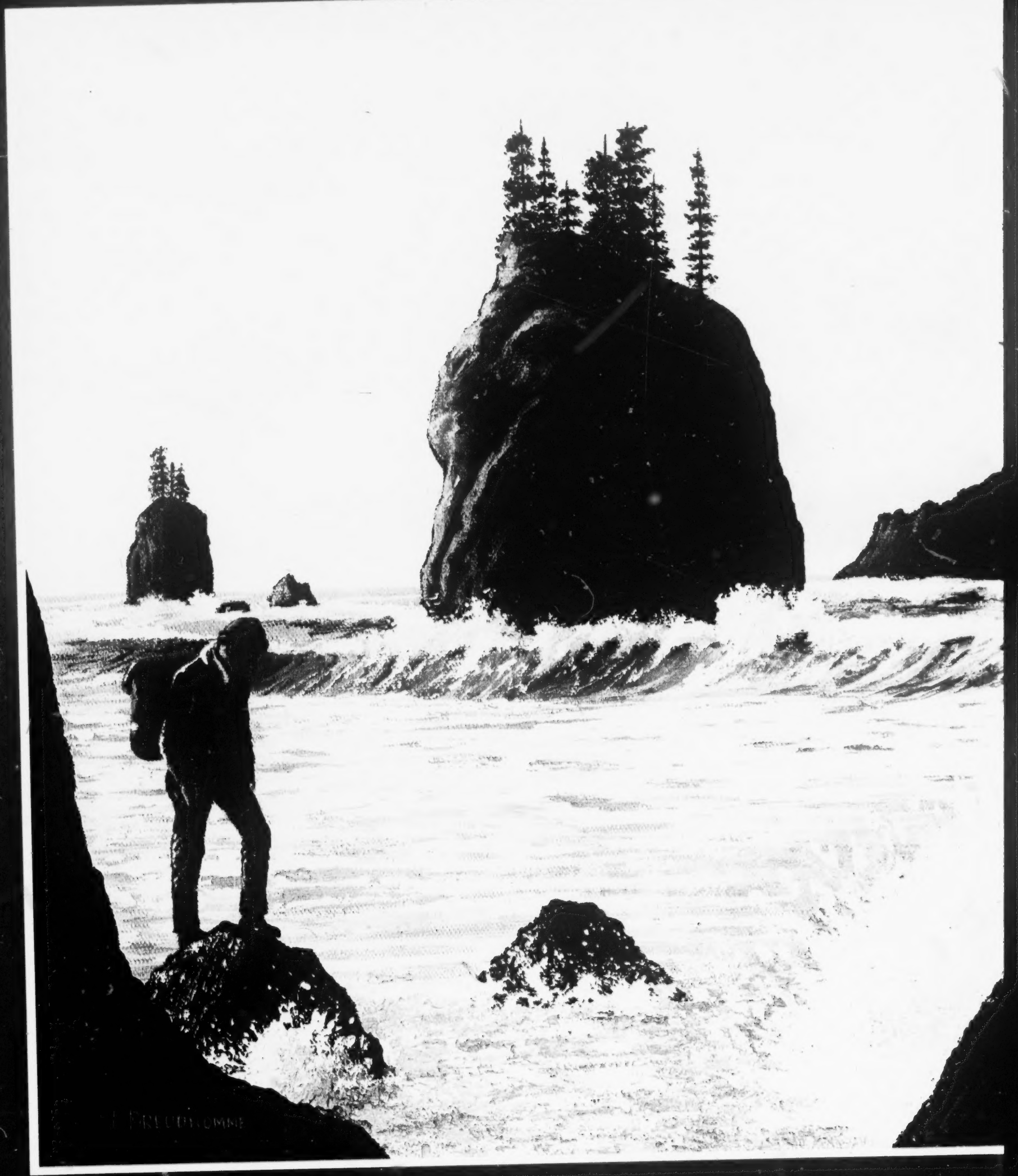
Shortnose sturgeon
Longjaw cisco
Lahontan cutthroat trout
Piute cutthroat trout
Greenback cutthroat trout
Gila trout
Arizona (Apache) trout
Humpback chub
Mohave chub
Pahranagat bonytail
Moapa dace
Woundfin
Colorado River squawfish
Kendall Warm Springs dace
Cui-ui
Devil's Hole pupfish
Comanche Springs pupfish
Tecopa pupfish
Warm Springs pupfish
Owens River pupfish
Pahrump killifish
Big Bend gambusia
Clear Creek gambusia
Pecos gambusia
Unarmored threespine stickleback
Gila topminnow
Fountain darter
Watercress darter
Maryland darter
Blue pike

Since 1967, the Bureau of Sport Fisheries and Wildlife has maintained a list of endangered species. This is the 1970 edition.

The list changes from year to year as the threat of extinction is reduced for some species, and increases for others. For example, eight species of whales, though not listed above, are now considered endangered and will be included in the 1971 listing.

The paintings by Walter A. Weber bordering this page represent species that are or have been considered endangered.

Science in the Service of Man



As we move into the 70's, we are beginning to understand that, in many cases, durable solutions to environmental problems require efforts that are painstaking, detailed and often obscure in their origins. There is an interrelationship of the whole earth system—wildlife, rivers, forests, minerals and man mutually dependent or at least influential upon each other.

Environmental research and repair work done by various agencies of the Department of the Interior take these "lifelines" into account. Coordination is achieved through the Office of the Science Adviser who keeps the Secretary informed of new developments and the various Interior agencies alert to what each other is doing.

Some of the areas of development and environmental protection that pose the most difficult challenges relate to the extraction, processing and use of minerals; production of power; and experimentations relating to purification of water.

Agencies working in these fields include the *Bureau of Mines*, the *Office of Coal Research*, the *Office of Oil and Gas*, the *Office of Saline Water*, and the following regional power administrations: *Bonneville*, *Southwestern*, *Southeastern* and *Alaska*. Their recent activities are reported in the following pages. (Allied work of the other Interior agencies is reported in earlier chapters.)

Science in the Service of Ma

"Americans have been remarkably faithful to the Biblical command to 'Be fruitful, and multiply and replenish the earth and subdue it.' In our explosive productivity we have sometimes been a little partial to one part of that command. We have been more zealous in subduing the earth than we have been in replenishing it. And this partiality cannot continue. If we do not replenish our earth, it will cease to be fruitful."

Senator Gordon Allott
Colorado

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The tools of science must be molded and shaped to serve the purposes of an enlightened mankind.

Turning Salt to Sweet

To help head off water shortages in the future, the Congress created the Office of Saline Water (OSW) in 1952 to provide technology for the most efficient and economical desalting processes at the earliest possible dates.

Since that time, OSW and the desalting industry have discovered and advanced techniques that can convert large amounts of saline water into a pure product at reasonable cost. The costs per 1,000 gallons have been reduced—in actual production plants—from about $4.00 to as low as 65 cents for desalting seawater and as low as 35 cents for converting brackish waters of less mineral content.

U.S. demands for quality water have been increasing at an accelerated rate, both because of a growing population and because of a rising per capita demand. Water is vital to the healthy operation of the economy and to manufacture the products Americans not only need but take for granted in an affluent society.

About 2,500 gallons of water are required every day to sustain a person's food chain. If you add the water necessary to produce fibers for clothes, per capita water demands go up to 3,000 gallons per day.

In the aggregate, the United States uses about 600 billion gallons of water per day. The total is expected to be at least double by 1980; by the year 2000, the Nation may be using as much as 1-2 trillion gallons per day.

With desalting plants of 1 million gallons per day (gpd) capacity now an established new source of fresh water, the Office of Saline Water is concentrating on the further advancement of technology for large-scale production plants to serve the water-poor residents of arid lands.

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For the conversion of seawater in 50 million gpd plants or greater, OSW will combine two reliable distillation systems in an experimental unit.

For purifying brackish water in multi-million gpd plants, OSW will construct and operate a 250,000 gpd test bed plant using a pressure technique applied to membranes.

These tests are expected to provide operation and performance data that will serve as guidelines for large-scale technology. The improved techniques will become available for commercial use in large production plants, thus further reducing the cost of desalting saline waters.

Approximately $4 million has been earmarked for construction of a test module that will combine the two distillation systems—the vertical tube evaporator (VTE) and the multi-stage flash (MSF) processes. Distillation involves boiling salt water and condensing the vapor, or steam, into fresh water.

With data from the module, the technological gap between present plants in the 2.5-7.5 million gpd range and the projected plants of 50 million gpd or greater will be spanned during the 1970's.

Desalting costs consist mainly of the capital investment for material (evaporator shells) and the energy (steam) used for operating conversion plants. Thus far, the lowest cost for desalting seawater—65 to 75 cents per 1,000 gallons—has been reported by the newly built 7.5 million gpd distillation plant near Tijuana, Mexico. Plants of 1 million gpd produce fresh water for about $1.00 per 1,000 gallons.

In the area of membrane technology, OSW awarded four contracts for the beginning of work under a four-phase program of construction and operation of a 250,000 gpd brackish water reverse osmosis test bed plant. (The reverse osmosis process utilizes permeable membranes and simple mechanical pressure to separate water from salt in producing fresh water.)

Significant progress has been made in the development of membrane technology, including both reverse osmosis and electrodialysis, for desalination of brackish waters. In electrodialysis, an electrical potential is used to pull the salt ions out of solution.

Several reverse osmosis plants with capacities up to 100,000 gpd are presently providing suitable water supplies for industrial and municipal uses at costs ranging from 50 to 75 cents per 1,000 gallons. A new 1.5 million gpd electrodialysis plant at Siesta Key, Florida, is converting brackish waters for a reported cost of 35 cents per 1,000 gallons.

The membrane processes have been playing a key role in a comprehensive field test program. Tests have been conducted on a wide variety of saline waters at Yuma, Arizona; Fort Morgan, Grand Junction and La Junta, Colorado; Laverkin, Utah; Las Vegas Wash, Nevada; Gillette, Wyoming; and Fairview Beach, Virginia.

These tests have indicated the feasibility of desalting a broad range of brackish waters to potable levels. Such waters include seawater, polluted saline surface streams, irrigation return flows, saline mineral springs and community water supplies with a high level of undesirable contaminants, such as selenium.

With the information obtained from these tests, as well as others conducted at OSW test sites in five States, guidelines can be established to determine what part desalting can play in cleaning up the Nation's lakes, streams and municipal water supplies.

In addition, OSW is focusing more attention on studies that determine potential needs and uses for desalted water to meet future water supply requirements. Cooperative studies have been undertaken with Federal, State and municipal water planning and supply agencies on the feasibility and economics of various desalting processes. This is a practical way for making current technology available to those who can benefit by its use. Ways of integrating desalting plants with conventional water supply sources are being developed also through such feasibility studies.

As concern mounts for heading off water shortages in the long-range future, particularly in the arid southwest Pacific region, the use of desalting as an alternative source for large regional areas is assuming added importance. For instance, major Federal-State cooperative water resources assessment studies in the western United States will include desalination as a potential alternative solution to basinwide problems.

Along with engineering development and specialized studies of water problems, OSW conducts a broad basic and applied research program in pursuit of its goals for low-cost fresh water. Solutions to water problems can be realized only if desalting specialists understand the de-

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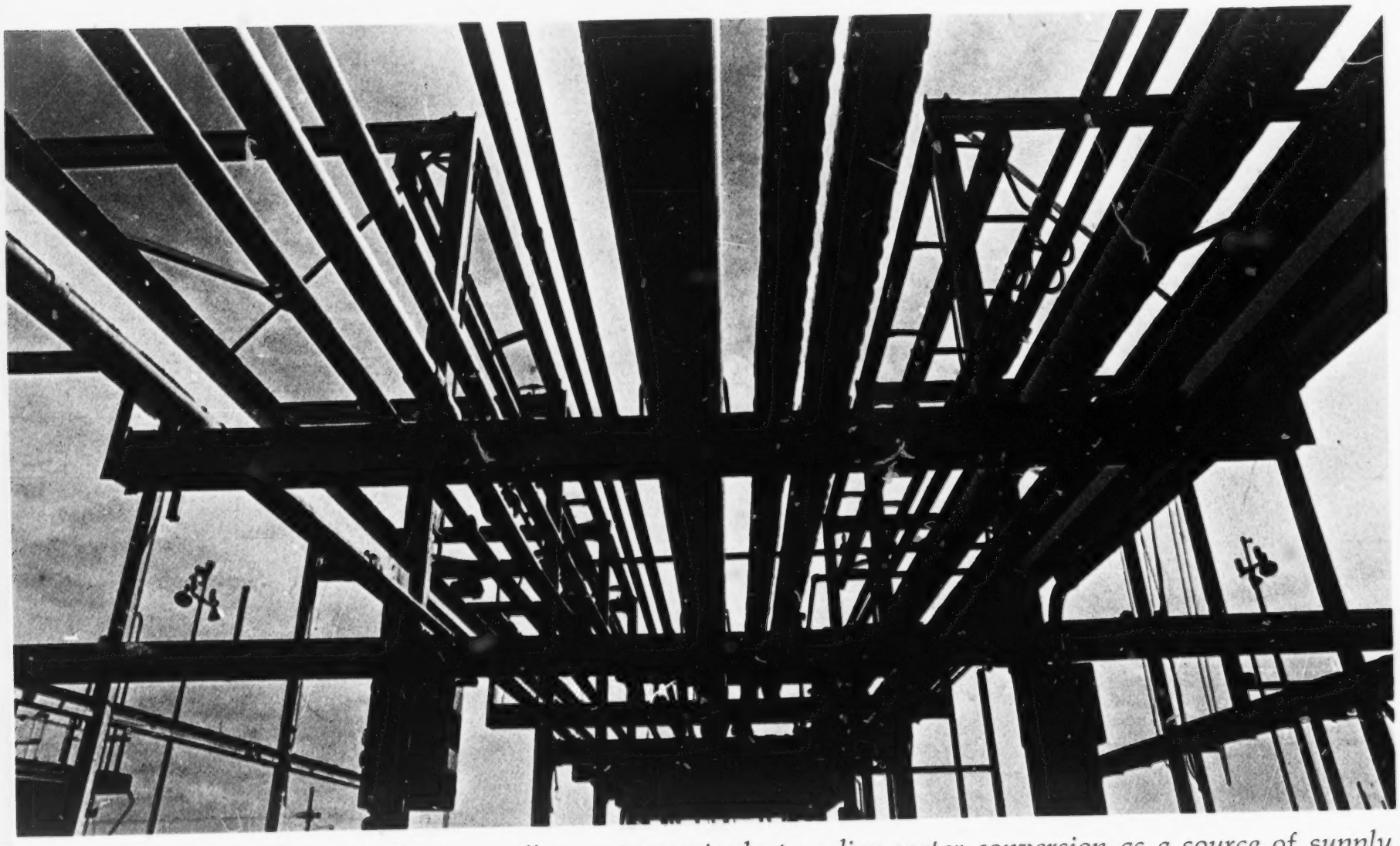

The Nation will turn increasingly to saline water conversion as a source of supply.

tailed nature of the problems and the saline substances with which they work.

The oceans, covering three-fourths of the earth's surface, offer an almost unlimited source of water for conversion processes. Seawater normally contains 3.5 percent salt, or 35,000 parts per million (ppm) of total dissolved solids. Bodies of water such as the Great Salt Lake and the Dead Sea have much higher levels of salt, running as much as 250,000 ppm.

A not-so-visible, but equally important, source of water is the underground brackish supply. Brackish water ranges from 1,000 to 35,000 ppm. Generally, water containing less than 1,000 ppm is considered fresh, but the U.S. Public Health Service sets 500 ppm as the recommended top limit for drinking water; some industrial processes require almost zero ppm.

Since ground water is such an integral part of desalting's scope and potential, its characteristics are significant.

About 10 percent of the rain that falls on the earth soaks into the ground and is held there in immense, sponge-like subterranean reservoirs called aquifers. These aquifers have been filled over the centuries. Presently, they contain—within a half mile of the earth's surface—a quantity of water estimated at 35 times as great as the amount in all of the world's fresh-water lakes and rivers at any one time. Ground water is usually free of turbidity and harmful bacteria—a definite advantage—but many aquifers are brackish in nature. In fact, one-half of the land area of the continental United States alone is underlain by ground waters containing between 1,000 and 3,000 ppm.

Significantly, ground water is usually found close to the point of use. Consequently, the desalting of brackish ground water can be an economical solution to water shortages. Deep, saline wells, which have been protected from short-term fluctuations of the weather, evaporation and surface pollution, are an attractive water source. This is especially true in the many regions where surface and shallow well water supplies have been reduced to dangerously low levels by drought conditions.

In keeping with the Presidential mandate for preserving the environment, OSW stepped up its studies of brine-waste disposal at desalting plants. Five contracts, totaling more than $126,000, were simultaneously awarded to support studies of the best approaches for obtaining solid (dry) effluent from desalination plants at inland locations.

To obtain a dry effluent, which promises more efficient disposal, contractors have been investigating the use of such processes as crystallizing evaporators, spray dryers, solvent extraction, immiscible liquid direct heat evaporators and unique forms of multi-stage flash evaporators.

In summary, OSW continues to strive for a quantum jump in accomplishment and, hopefully, a breakthrough in technology. With advanced desalting techniques in hand, man will be assured of fresh water when and where he wants it and at a reasonable price.

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Environmental concern must be built into "blueprints" of power projects.

Water Becomes Power

Bonneville Power Administration has been the marketing agent since 1937 for power generated at Federal dams in the Pacific Northwest. The BPA grid provides about 80 percent of the high-voltage transmission capacity of the region and serves all of the electric utilities. This arrangement permits the use of larger lines which provide fuller service at less cost and assure reliability of the separate distributors' systems.

As more transmission capacity has been required, BPA's grid has been upgraded to higher voltage conductors which use only slightly wider right-of-way than smaller lines. For example, a 500,000-volt line requires a right-of-way 150 feet wide but has four times the capacity of a 230,000-volt line which requires 125 feet. BPA's direct current intertie with California is rated at 800,000 volts and has a 150-foot right-of-way.

The effect of power operations on the environment has been a consideration of BPA's planning since its first transmission lines were constructed. Environmental sensitivity was demonstrated whenever transmission lines or substations were built which did not take a least-cost, shortest-distance-between-two-points route. The environmental integrity of one of North America's most scenic areas, the Columbia Gorge, for example, has been preserved by building transmission lines which are out of sight of travelers in the gorge.

Bonneville Power Administration's concern for environmental quality encompasses three facets of the Pacific Northwest power picture: (1) BPA's own operations and facilities; (2) the operations and facilities of BPA's customers; and (3) joint planning with other electric utilities for the forthcoming transition from a virtually all-hydro power base to a combined hydro and thermal power system (known in the region as the Hydro-Thermal Power Program).

In operating the transmission grid, BPA tries to avoid pollution of air, water and space. Physical environment is protected by using the same right-of-way for more than one transmission line, thereby minimizing land use. Control of construction and maintenance operations, and proper waste disposal practices at BPA installations help preserve natural beauty, as does careful design of powerlines and substations to lessen their effect on scenery. By using natural and cultivated plant growth as screening, the appearance of facilities is improved where intrusion into the scenery is unavoidable. Audible noise and radio and television interference associated with electrical operations is avoided, wherever possible, by careful design.

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Since the 1950's, BPA has worked closely with the U.S. Forest Service and other Federal agencies in locating transmission lines across public lands. Consultation with these agencies is carried on at the earliest stages of planning in order to locate, design and construct facilities most compatible with forests and other public lands.

Design criteria have been developed by BPA which will make transmission lines and substations less obtrusive. Right-of-way clearing practices are being changed to preserve natural growth, wherever this can be done without interference with conductors. Lines are to be kept below the horizon wherever possible in hilly ground. Highway crossings are to be screened by preserving trees and using long span towers (higher and farther apart), and long straight stretches of line will be avoided by occasionally deflecting the right-of-way. These design criteria have been adopted by the Departments of the Interior and Agriculture and have been issued as recommendations for all utilities constructing power facilities.

Bonneville has taken still another step to meet the challenge of preserving the environment while carrying out the requirement of the Bonneville Act to market Federal power at the least possible cost. Research and development are in progress to further reduce the effect of power operations on the environment. Included in these efforts are investigation of ultra-high-voltage transmission in the million-volt range which, if successful, would permit transmission of larger blocks of power with proportionately less tower construction and right-of-way space use.

Bonneville's concern for environmental quality also includes operations and facilities of industrial customers. Since 1939, a provision has been included in all BPA industrial sales contracts giving the Administrator the right to stop delivery of power whenever a customer's activity pollutes a Pacific Northwest river or detracts from the scenic beauty of the Columbia Gorge. This same provision was part of BPA contracts with electrical utility customers until 1966, when BPA broadened its contract provisions to permit curtailment of power delivery if a Federal, State or local pollution agency determines that the utility served by BPA is not in compliance with water quality standards of the agency. This provision is being included in contracts with utility customers as renewal contracts are made.

Also, since 1966, all BPA industrial customers who want to increase their power purchases for new or expanded plants have been required to sign an agreement obligating them to install the best commercially available equipment for the prevention of air and water pollution and to comply with applicable pollution control regulations.

In future power sales contracts, BPA will incorporate an even stronger environmental provision which will reflect new Federal law and policy. This provision, which applies to industrial plants served by BPA and thermal generating plants of its utility customers, provides that the customer must make pollution control plans and specifications for new or expanded plants available to BPA. BPA will not be obligated to provide service to that customer if: such plans have been disapproved by the responsible governmental pollution control agency; such an agency has finally determined that an industrial plant served by BPA or a utility customer's thermal generating plant is in violation of antipollution requirements; or BPA determines such a plant is harming the scenic beauty of the Columbia Gorge.

Transition of the Pacific Northwest's power system from a virtually all-hydro system to a hydro-thermal system is already underway. Minimizing the ecological and environmental impact of powerplants, transmission lines and substations presents an even greater challenge than has been faced in the past. Although the Federal Government will not build any of the thermal plants, BPA as a participating Federal agency is charged with the responsibility of implementing such legislation as the Federal Water Pollution Control Act, the Fish and Wildlife Coordination Act, the Water Quality Act, the Clean Air Act, and the National Environmental Policy Act of 1969. The Pacific Northwest Hydro-Thermal Program will permit the power requirements of the region to be met with the least detrimental effect on environment.

In the 27 years since the Southwestern Power Administration was established, the agency has been designated to market the output from 23 Federal multipurpose hydroelectric projects which have been completed or are under construction in Oklahoma, Arkansas, Missouri, Kansas,

Texas and Louisiana. SPA has constructed 1,653 miles of high voltage transmission lines, 11 switching stations, 16 substations and eight customer substations.

SPA coordinates transmission line location and structure siting (siting for switching stations, substations, etc.) with local, State and Federal agencies, to minimize adverse environmental effects. Every effort is made to provide the least possible conflict with the natural beauty and land utilization of the area, while still meeting technical and economic requirements.

The operation of the reservoirs has a major impact on the recreational use of those reservoirs and streamflow regulation below the projects. Generation schedules usually enhance the environmental quality of the area.

Power generation from hydroelectric plants does not contribute to thermal pollution of downstream waters. Instead, hydroelectric generation supplies power needs which otherwise would have to be met by thermal sources which contribute to air and water pollution.

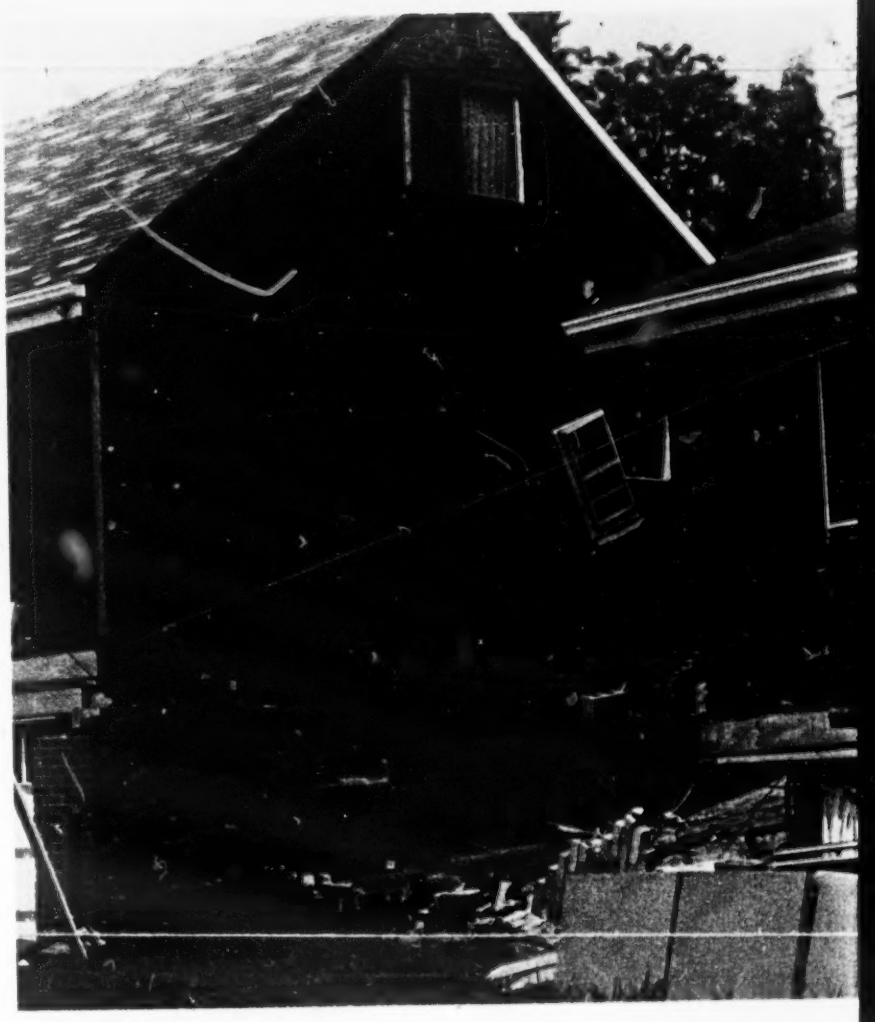
Multipurpose reservoir projects constructed by the U.S. Army Corps of Engineers produce a significant hydroelectric power resource which is marketed by the Southeastern Power Administration with headquarters in Elberton, Georgia.

The developments, located in the Roanoke, Savannah, Appalachicola, Alabama and Cumberland River basins, have an installed capacity of over 1.9 million kilowatts in 16 plants. Five additional projects, with more than 800,000 kilowatts, are under construction and scheduled to begin operation during the Seventies. Five more authorized projects will add another million kilowatts to the system of SEPA.

This power and energy is marketed to 178 preference customers located in Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee, Kentucky, Indiana and Illinois (99 rural electric cooperatives, 77 municipalities, one State agency, and one county agency), as well as to six private utilities and the Tennessee Valley Authority.

While none of the reservoir developments is considered primarily a power project, power revenues will repay nearly two-thirds of the aggregate project investment. Purposes served other than power production include flood control, navigation, water quality control, municipal water supply, and fish and wildlife enhancement. The developments also provide a source of water-oriented recreation for millions of our citizens.

Ever-increasing demands for reliable electric power require patterns of operation which will provide not only a marketable product and yield a sufficient return to repay power costs, but also will guard against upsetting water levels, inundating river basins and other hazards to the environment.



Like many of the State's resources, the hydropower resources of Alaska are practically untouched. Of the 32 million-kilowatt hydroelectric power potential, the 30,000 kilowatt Eklutna project is the only major operating project. When completed in 1972, the Snettisham project will add 70,000 kilowatts of capacity to the Alaska Power Administration (APA) system.

When created in 1967, APA was given charge of promoting development and use of the water, power and related resources of Alaska. It is responsible for determining how to use this potential without abusing the environment, and is in the unique position of being able to do this at a time when the State's natural beauties are virtually untouched and undeveloped.

APA is striving to preserve the living beauty of Alaska while at the same time planning compatible uses of its abundant natural resources.

Repair and Renewal From the Bottom Up

In 1970, Bureau of Mines engineers completed one of the biggest environmental repair and protection jobs ever undertaken by the Interior Department. This job required four years of labor and over $5 million to control an underground mine fire threatening the city of Scranton, Pennsylvania.

The catastrophe occurred in 1966. The fire, which originated in an abandoned strip-mine pit, had burned its way

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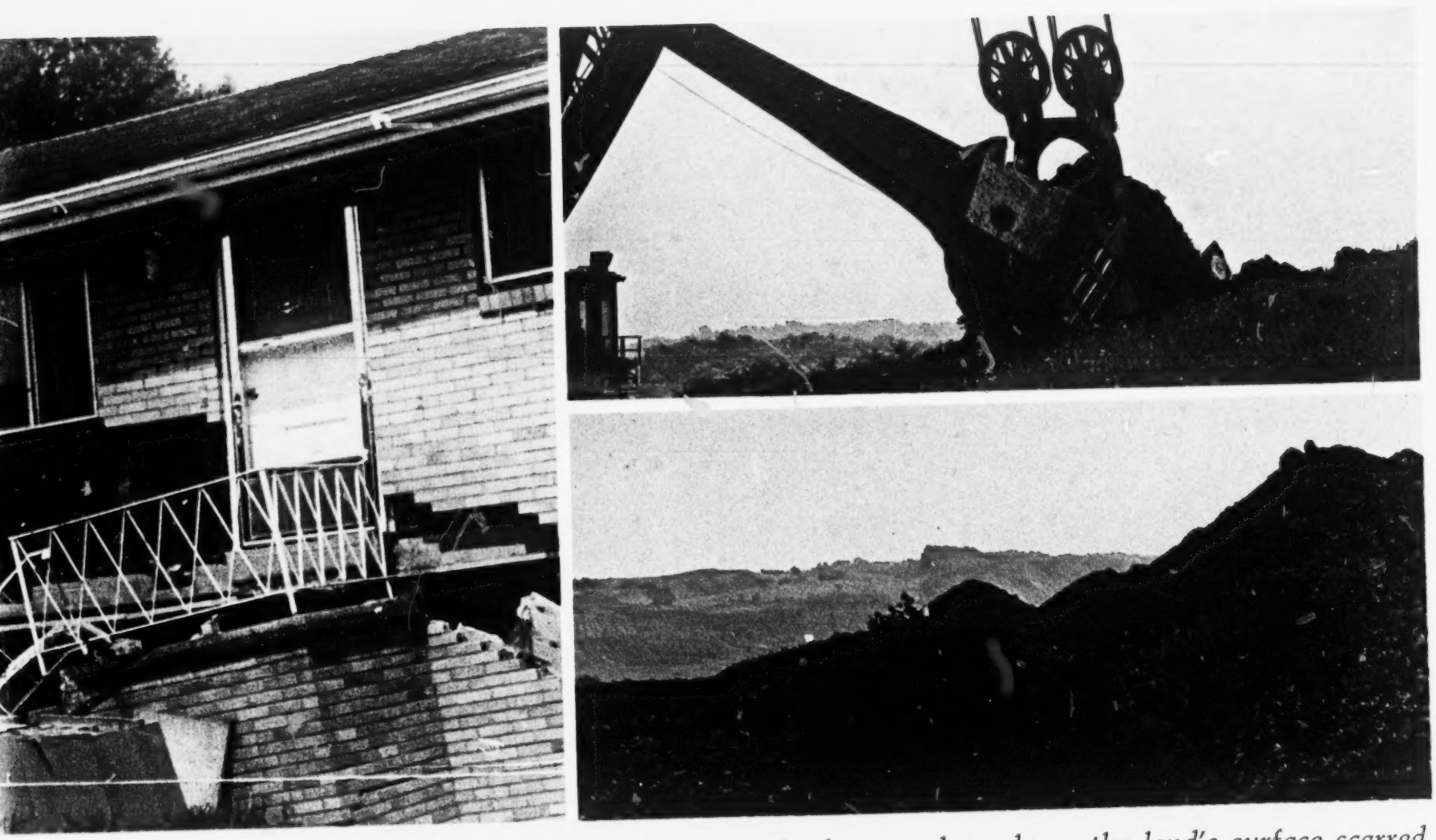


Improper mining procedures can cause subsidence and can leave the land's surface scarred.

into abandoned mine tunnels under the Cedar Avenue district of Scranton. Late in 1966, deadly carbon monoxide gas began seeping upward from the fire into the basements of homes in the neighborhood, and dozens of families had to be temporarily evacuated. Many were homeless during Thanksgiving and Christmas holidays.

Working with State officials, Bureau of Mines engineers planned and supervised an emergency drilling program to bleed off the toxic gas and locate the underground combustion zone. Then followed a three-year control project that began with the excavation of a three-quarter-mile, 190-foot-deep trench between the threatened neighborhood and the fire zone. The trench, intercepting the burning coal beds, was backfilled with incombustible material to isolate and eventually smother the fire. The fire was not brought under full control until mid-1970. Finally, the land surface was restored to permit its reuse by the city. Total cost—nearly $7 million including $1.5 million to compensate owners of property that had to be condemned to make way for the man-made canyon.

Impressive as it is, however, such an effort is more in the nature of repair than prevention, and, therefore, is not typical of the Bureau's environmental quality programs. Preventing problems like the Cedar Avenue fire is an obviously superior alternative to dealing with them as crises. In the field of mining, the present need is for a whole new technology—one that can extract minerals with due respect for environmental values. Such technology would free future generations from the threat of environmental catastrophes like the Scranton fire. Technology can serve to alleviate health and safety hazards and forestall environmental problems often related with surface and underground mining.

Over 80 percent of our domestic mineral production comes from surface mines . . . mines that take up land increasingly in demand for other purposes . . . mines that have created irreparable eyesores in many States . . . mines that, abandoned and unreclaimed, can give rise to environmental problems like water pollution and the fire that menaced Scranton.

Putting mines back underground, where environmental damage is far less a threat, is the long-range goal of the Bureau's mining research program. Developing the necessary "mine systems" technology is a job that begins in the laboratory with years of basic research that may seem hard to relate to mining. One study completed recently, for instance, developed a way to predict the response of rock to stresses caused by alternate heating and cooling. Thermal stress may someday replace the use of explosives to break rock in some kinds of mines. Underground mining needs better rock-breaking methods to make it more competitive with surface mining.

The Bureau's international primacy in this kind of research won it a major role in the International Advisory Conference on Tunneling, held in Washington during June 1970. Under the auspices of the Organization for Economic Cooperation and Development, delegates from 20 nations met to identify inadequacies in underground excavation

Due to increased inspection responsibilities, the Bureau of Mines is training more mine inspectors. (Far right) Through a new process, garbage is converted into a liquid resembling crude oil.

technology and to suggest corrective action. The Bureau coordinated the activities of nearly a dozen U.S. agencies involved in the conference and contributed its considerable experience and expertise to the drafting of the final report.

This document included a recommendation that cooperative international action be undertaken to remedy today's serious deficiencies in underground excavation technology.

One of these deficiencies, a lack of adequate protection for the health and safety of miners, creates a special kind of environmental problem for the men who produce the Nation's minerals. In his 1969 message to Congress on occupational health and safety, President Nixon pointed out, "There has been much discussion in recent months about the quality of the environment in which Americans live. It is important to note in this regard that during their working years most American workers spend nearly a quarter of their time at their jobs. For them, the quality of the workplace is one of the most important of environmental questions."

For America's underground miners, especially her coal miners, the quality of the working environment has been among the most hazardous in the Nation. An average of four men per day have died in the Nation's coal mines since the turn of the century. The death rate in terms of man-hours of exposure to mining hazards has not dropped substantially in the last two decades, in spite of spectacular changes over that period in the technology of extracting coal.

This lag in coal mine safety technology is a primary target of Bureau research, which began the 70's with several accomplishments that offer hope for a greatly improved mining environment in the future.

One of the most significant was the use of a new technique to give advance warning of the number one killer in underground mines, falling rock and coal. Dangerously loose rock or coal, in the roof or wall of a mine, is not always easy to detect. Too often a mass of rock crashes down without warning to crush out the lives of miners. The Bureau's new technique spots dangerously loose material by "taking its temperature" from a safe distance. An instrument sensitive to infrared rays—a measure of temperature—is used to scan part of a mine wall or roof. Ventilating air, coursing through the mine, makes loose rock or coal slightly cooler than surrounding material, and the difference shows up on the instrument. Then the loose rock can be safely removed or adequately supported.

The technique is still in its development stages, and special infrared thermometers are now being designed and built to meet the unique requirements of underground coal mines. If they can be used successfully, a dramatic drop in the death rate could follow.

In another approach to the same critical problem, the Bureau has found that special high-strength plastics can actually "heal" fractured rock in a mine wall or roof. The plastic is injected into the fractures in liquid form, then treated with heat and catalysts to solidify it, a process called polymerization. Rock bonded with the polymer is sometimes stronger than it was before it fractured, and possesses a plastic coating that resists the deteriorating effects of mine water and heat.

The Bureau is now engaged in laboratory work to develop plastic polymer systems that can be used under the varying conditions found in actual mines. The goal—a method that can ultimately make the walls and roofs of mine passageways completely self-supporting.

The biggest environmental threat to the health of coal miners is coal dust—dust that, generated in the cutting and moving of the coal, finds its way into the terminal passages of the lungs. Years of exposure to this kind of dust can cause "black lung," or coal miner's pneumoconiosis—a disease that can, in advanced cases, bring death. It has been estimated that more miners die ultimately of black lung than are killed in mine accidents.

A significant advance in dust reduction was achieved during the year by the Bureau, which found that application of conventional technology can greatly reduce the exposure of miners to dust generated by the most important source—continuous mining machines.

These devices, usually over 30 feet long, chew or bore their way through solid coal. Their high productivity has made them widely popular in underground coal mines, but they also produce high concentrations of dust where they operate. The Bureau found that much of this dust could be kept out of the lungs of the mining-machine crew—the men in greatest danger—by dispersing the dust with high-pressure auxiliary fans. Most coal mines are already equipped with special ventilating systems, so that the cost of installing auxiliary fan systems would be relatively moderate. This important discovery makes it possible for mine operators to comply with the first Federal dust standard, set by Congress last year, by using conventional, readily available equipment.

Looking ahead, however, new technology will be needed to meet more stringent standards that will be applied in coming years. Research on better dust control techniques is an important part of the Bureau's work to improve the mine environment. Because the need is urgent, some of this research is being done by private firms under contract to the Bureau. For example, under a major contract awarded this year, an eastern firm will explore ways in which the cutting heads of continuous mining machines can be redesigned to produce less respirable dust and more large pieces of coal. Improved designs will be field-tested under actual mining conditions. A western company will evaluate all types of contemporary dust-collecting equipment with a view toward adapting new techniques to the mining environment. The work will include a detailed analysis of the nature and composition of coal dust. A midwestern firm will test chemical foam as a dust suppressant.

Meanwhile, the most recently completed dust research effort within the Bureau showed that, in some kinds of mining where explosives are used to break the coal, dust production can be reduced by stemming the explosive charges with water-filled bags.

Research is one of two major ways in which the Bureau tries to achieve a better working environment for miners. The other is mine inspection to enforce health and safety laws and regulations. The Bureau's inspection responsibilities increased greatly in 1970, as it began enforcement of two major laws covering all the mines in the United States.

The first is the Federal Coal Mine Health and Safety Act of 1969. Although many of its requirements and standards were spelled out by the Congress, many others had to be drawn up and set forth by the Secretary. Giving assistance in the drafting of regulations is an important Bureau job. This immense task requires writing comprehensive health and safety rules for every aspect of coal mining, from drilling and blasting to control of respirable dust, use of electricity and transportation of men and coal. The rules cover every kind of coal mine—large and small, surface and underground.

Enforcement of the Act was the next monumental task. Late in 1969, when it became apparent that a new law would probably be passed, the Bureau began hiring and training new coal mine inspectors to enlarge its staff of about 250. As finally passed, the law requires an inspection force of about 1,000—a goal the Bureau hopes to meet by the middle of 1971.

Because experienced coal miners are most readily trained as inspectors, the Bureau's recruiting drive is aimed at miners across the Nation. Radio and television are widely used to get across the Bureau's message: The Federal Government has outstanding career opportunities for coal miners. Special Civil Service coal mine inspector examinations were held in mining towns throughout America to make it as easy as possible for potential candidates to join up.

A National Mine Safety Academy is being established to train new mine inspectors. Its university-level courses will also be used to keep experienced inspectors up-to-date on new health and safety developments in mining technology.

Meanwhile, the Bureau made plans to use its existing inspection force with maximum efficiency. Enforcement was begun in March 1970, with a series of "partial-but-representative" inspections that allowed the Bureau to visit

very underground coal mine as quickly as possible. This as accomplished by having inspectors examine representative parts of the larger mines. Then the Bureau concentrated its manpower on spot inspections of mines with specially hazardous conditions. Next in priority was a complete inspection of every underground coal mine.

Altogether, the Bureau's goal has been to make about 0,000 mine inspections by the middle of 1971—roughly 85 ercent of the number required by the Act. From that time n, the Bureau calculates, its inspection force should be arge enough to make all the inspections required in the aw.

Similar efforts were carried out by the Bureau under the Federal Metal and Nonmetallic Mine Safety Act of 1966. This law gives Federal protection, for the first time, to workers in America's 18,000 non-coal mines, both surface and underground. Health and safety regulations authorized by the Act were recommended to the Secretary by special advisory panels, and took effect on July 31, 1970. The Bureau began inspections immediately. Its force of inspectors, although smaller than the coal mine inspection force, is adequate to the task because there are far fewer underground mines to inspect in this category. In addition, the metal and nonmetallic mine safety law requires fewer annual inspections than the coal mine law.

The Bureau believes that enforcement of these two laws, coupled with aggressive research to upgrade the quality of mine health and safety technology, will bring a measurable improvement in the miner's environment during the new decade. Perhaps in the foreseeable future, mining will no longer be counted among the most dangerous occupations pursued by men.

Overseers of Our Hidden Resources

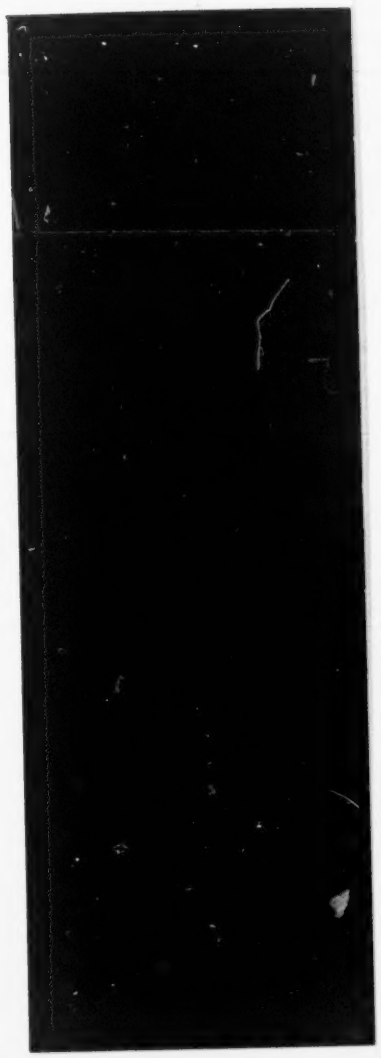
Coal is an abundant U.S. energy resource. The Office of Coal Research (OCR) was established to develop utilization of this resource through contract research and development.

It is estimated that consumption of energy at the turn of the century will be several times today's use, provided such energy is available.

Future energy requirements can be satisfied only if the fossil fuels, hydroelectric and nuclear energy make maximum contributions. Environmental considerations, technological developments, supply, demand and price relationships, consumer choice and Government energy policy, will determine each energy source's contribution.

The Office of Coal Research has underway a comprehensive program for the conversion of coal to liquid and gaseous fuels as well as programs for the production of electricity by conventional and technologically more advanced methods. Each facet of the program will reduce or eliminate potential environmental contaminants.

A prospective gap in natural gas supply will be difficult to close unless synthetic gas from coal is available fairly soon and in increasing quantities. The American Gas Association is contributing a portion of the costs of OCR's coal-to-gas conversion research conducted by the Institute of Gas Technology. This research promises to produce synthetic methane from coal at competitive prices. It is the most advanced of the conversion research processes and should be available for use when alternatives are few and the need for additional gas is great.



The proposed Alyeska pipeline, which would carry oil 800 miles across Alaska, has proved one of the most controversial environmental proposals of recent years. Adding to the complexity of the problem is the need to settle Native land claims and the increasing U.S. demand for oil.

The Office of Oil and Gas, the Department's main contact point with the oil and gas industry, encourages efforts by the industry to solve environmental problems raised by the nature of its operations. In this endeavor, the Office works closely with the National Petroleum Council, a top-level industry advisory group to the Secretary. The Council has recently undertaken a comprehensive study of conservation responsibilities of the petroleum industry, and has issued an interim report discussing key issues.

In almost every phase of its production, transportation, processing and use, petroleum affects the environment. The production of oil brings vast quantities of salt water to the earth's surface, which must be disposed of in a way that does not contaminate fresh-water sources. Tankers carrying as much as a half-million barrels of oil per trip regularly enter our major ports to discharge their cargoes; precautions must be taken lest accidents involving these tankers create mammoth oil spills. The gasoline-powered

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automobile accounts for 60 percent of all air pollution in the United States.

The environmental challenge of the Seventies demands that we reconcile the vast and necessary production and consumption of oil with measures required to protect and preserve our natural heritage.

The request by the Alyeska Pipeline Service Company for a right-of-way to carry oil 800 miles across Alaska has presented Interior an unprecedented challenge and has set off one of the most complex environmental controversies in recent years.

Under the proposal made by Alyeska—a service subsidiary of seven major oil companies with leases on the petroleum-rich Arctic slope of Alaska—a 48-inch pipeline would be constructed from Prudhoe Bay southward across barren tundra, rugged mountains and forests, and numerous rivers and streams, to the ice-free port of Valdez on the south coast. There, the oil would be loaded aboard tankers and carried to Puget Sound and possibly other West Coast ports.

The pipeline would be one of the biggest privately financed construction jobs in history. Most of the land proposed to be crossed is public domain, administered by Interior's Bureau of Land Management.

Alaska Native land claims, fisheries, wilderness values, existence of archeologically significant sites, potential water pollution and wildlife injury, and the balance of unique and fragile life systems—all these, and other considerations, have entered into the public hearings and agency comments on the plan. The oil would flow at high temperatures and great volume so a pipeline break caused by accident or earthquake could be disastrous unless immediately checked.

Deeply involved in the problem is the unquestioned U.S. need for oil in an era when demand is rising and the Nation appears headed for increased dependence on uncertain foreign sources. Alaska's economy and State revenues are among other factors to be weighed.

More than two years of Government and private study have gone into the project; many stipulations have been adopted to safeguard against ecological damage, but numerous questions remain unanswered.

Secretary Morton has declared that the Alaska Native claims issue, directly involving the future of more than 50,000 Americans, will be given high priority in any resolution of the overall problem.

While Congress was considering Native land claims legislation, Secretary Morton ordered an inter-agency study of the tanker phase of the proposed transport system and directed that all feasible alternatives to the Alyeska pipeline plan be given thorough consideration.

He made it clear that he believed Arctic Slope oil and gas must be brought to market, but that he was actively seeking answers as to the best possible method.

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Of Land and People

One of the mysteries of our planet is the enigma of man himself. Where and when he first emerged is more a matter of scientific speculation than certainty.

But, for our purposes here, it does not matter where the first people of the North American continent, or the first people of the island possessions, originated. What does matter is that we keep in mind the environmental lessons they can teach. Their ways are not to be discounted in our endeavors to develop nature's resources for the modern needs and uses of civilization.

The nature of the land had a profound impact upon the life styles of our early inhabitants. Evidences of how the land dominated their lives can be found not only in archaeological treasures, but also in some of the customs and values retained by their modern descendants.

Preserving the human heritage while developing a modified environment is an aspect of the conservation thesis that Interior is helping foster.

Programs of the *Bureau of Indian Affairs* and the *Office of Territories* emphasize the human resource.

Of Land and People

"This nation's continuing effort to improve and maintain the quality of our natural environment must be accomplished within the framework of an overall economy, for man must depend upon the earth's natural environment to meet his daily needs; thus, we must learn to develop, use, and manage our natural resources in such a way as to maintain both quality of the environment and our standard of living."

Congressman Wayne N. Aspinall
Colorado

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The land shapes the people and the people shape the land. Where conditions have been most adverse, cultures have failed to prosper and people have lived at a subsistence level.

People of the Sunny Isles

VIRGIN ISLANDS. The American Virgin Islands, encircled by the Caribbean Sea and Atlantic Ocean, lie less than 1,000 miles south of Miami. They comprise a group of rugged mountainous islands rising sharply from the sea, and are directly in the path of the tradewinds. Lacking in important minerals, timber or other raw materials—or even an adequate natural water supply—the islands have developed tourism as the backbone of their economy. Today the Virgin Islands enjoy the highest standard of living in the Caribbean, and a push for more industrial and agricultural production may provide still further economic growth.

The political maturity of the people is evidenced by recently enacted legislation providing for local election of the Governor, effective January 1971.

The islands are experiencing a population boom—from 32,000 in 1960 to an estimated 70,000 today—with the resultant environmental concerns. The combination of more people and increased industrial development has led to assaults upon the natural environment that are typical of pollution problems in all economically active areas of the world. However, the Virgin Islands government is not sitting idly by.

The Caribbean Research Institute of the College of the Virgin Islands is involved with scientific studies of the regional ecology. The institute is developing a tri-island research facility and is engaged in such studies as fisheries potential, beach conservation, practicality of artificial reef

85 79

construction and water pollution control. A Marine Resources Council, established early in 1970, is conducting a comprehensive study of the Virgin Islands' marine resources.

The government of the Virgin Islands co-sponsored one of the most ambitious undersea projects to date—Tektite II—an exciting and industrious effort to explore and study the abundant marine resources in the surrounding waters of Lameshur Bay on the Island of St. John. One of the major purposes of the project was to accelerate the development of ocean science and technology by using the ocean floor as a laboratory where scientists performed research. Due to this project, marine resources have been receiving additional developmental attention.

The programs and regulations of Federal agencies and bureaus concerned with pollution are all applicable to the Virgin Islands. Independent of the Federal requirements, the local government, early in 1968, embarked upon a program of conservation and beautification which has as one of its principal objectives the abatement of existing pollution and the establishment of preventive measures. Water quality standards have been set for the coastal waters surrounding the islands and a water quality monitoring program has been established to assure excellent water quality. New sewer systems are being constructed on all three inhabited islands to eliminate degradation of the island waters. A waste management study has been made and a master solid waste management program is being developed.

Clean, clear air and water, and beautiful beaches are assets of incomparable value. The government of the Virgin Islands is engaged in a vigorous effort to guard and protect these assets.

Visitors to Virgin Islands National Park marvel at the brilliance and variety of the land.

AMERICAN SAMOA. The picturesque islands of American Samoa, comprising 76 square miles, are nestled in the sapphire blue waters of the South Pacific halfway between Honolulu and Sydney. The lush, green palm-encircled islands are a territory of the United States, and the people represent one of the few remaining societies of Polynesians. The culture of the territory is steeped in ceremony and mythology. Ancient customs and traditional ceremonies remain meaningful within a context of contemporary island environment. The population has increased from some 5,700 in 1900, to an estimated 28,000 today.

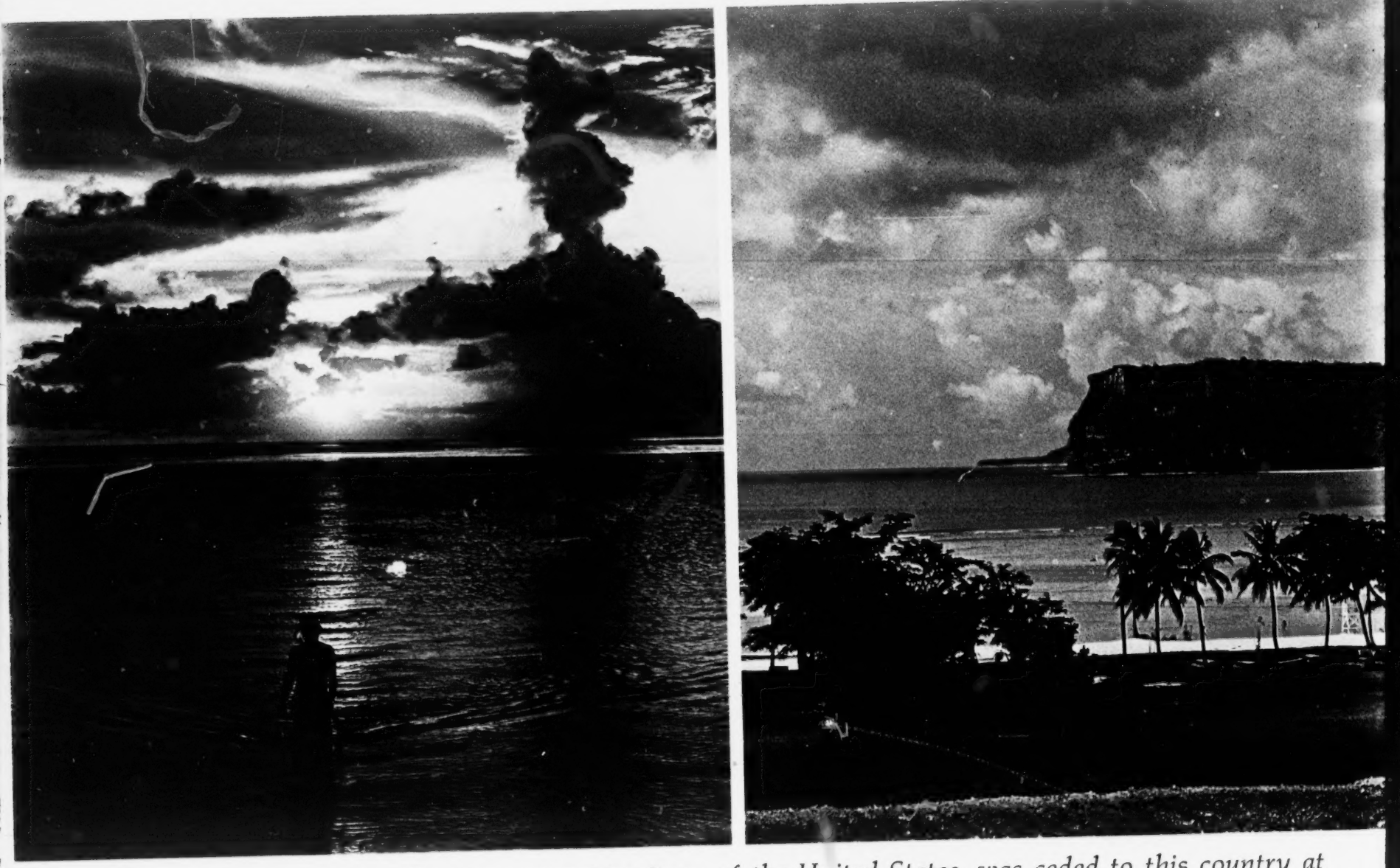
Pago Pago Bay, on the island of Tutuila is renowned as the South Pacific's most beautiful natural harbor and is sheltered by the mist-shrouded Rainmaker Mountain.

American Samoa came into the possession of the United States in 1899 following an agreement with Great Britain and Germany. Education, housing, roadbuilding and, more recently, development of tourism, have been the directives U.S. administration has taken. The Samoans established their own constitution in 1960.

Economic development and population growth have brought to Samoa some of the environmental problems faced by the United States itself. Major degradation of the environment has been occurring in many areas. In the past, road and public utility construction projects were undertaken with little or no regard for the damage done by blasting reefs, changing the course of streambeds or bulldozing away portions of mountains. The wastes from villages and the canneries, together with considerable oil spillage, have seriously polluted the water. Dredging activities also have produced silting and turbidity.

Land erosion, too, can produce a serious silting problem on the reefs, and as reef organisms are easily smothered by silting, the effects can be disastrous. With steep land contours and heavy rains, erosion is a grave threat to both the land and adjacent waters. In this connection, road construction creates a major problem. The reefs fringing much of the islands are an important resource. As much as 50 years may be required to recover from damage to them.

Procedures have been established to clean up the Bay. New sewer lines are under construction and vessels in the harbor are being policed to prevent the dumping of waste or oil. Proper construction is preventing further erosion and silting. Through extensive education and proper planning for the future, it is anticipated that the environment of American Samoa ultimately can be restored to its natural state, incredibly beautiful and unspoiled.



Guam, the westernmost territory of the United States, was ceded to this country at the end of the Spanish American War. Today Guam is becoming a tourist haven.

GUAM. The island of Guam, the westernmost territory of the United States, is a small emerald dot in the vast blue Pacific. It was ceded to the United States in 1898, at the end of the Spanish-American War. Located in the Mariana Islands, Guam is the "Gateway to the Orient," 1,400 miles from Manila and 5,200 miles from San Francisco. The population is estimated to be 90,000, including military.

A devastating hurricane in 1962—which prompted a vast reconstruction program—changed Guam's economy from a slumbering tropical island to that of a tourist, communication and transportation center.

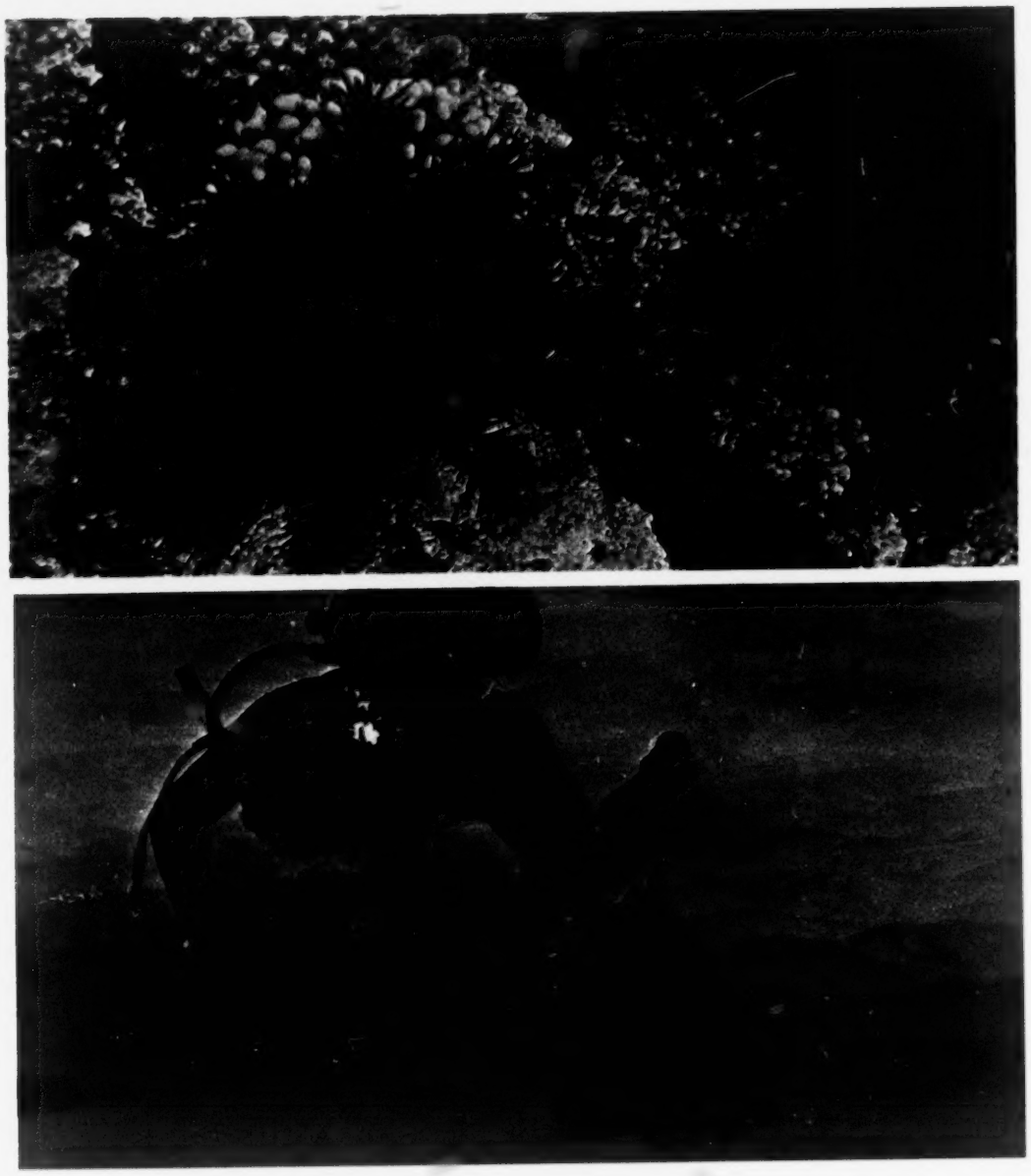
The people of Guam seek economic progress, but they also seek to retain the beauty of the island and the protection of the land and resources from environmental assaults. With the first elected Governor in 1970, Guam is preparing to meet these challenges, and considerable progress is being made in planning for all aspects of the environment.

A major step in assuring clean water was the development of a plan for an islandwide waste-water system, which includes civilian and military needs. The plan divides the island areas, both military and civilian, into districts based on population distribution, topography and location of discharge points.

An islandwide plan for solid-waste management is under preparation. The outdoor recreation plan and sections of the territorial master plan are being revised. Attempts to accelerate the establishment of a national seashore park and a national historic park are being made. An authorizing act for air pollution control was passed. A marine laboratory with facilities for environmental research is under construction.

Through these and other programs, the government of Guam is giving high priority to protection and enhancement of the environment.

TRUST TERRITORY OF THE PACIFIC ISLANDS. The Trust Territory of the Pacific Islands (called Micronesia) consists of the former Japanese mandated Marianas (excepting Guam), Marshalls and Caroline Islands. The whole Trust group comprises more than 2,000 islands, of which about 100 are inhabited. They are scattered over some 3 million square miles of the Pacific Ocean, with a combined land area of 687 square miles and a population of about 90,000 of diverse origins and cultures.



The proliferating Crown of Thorns starfish threatens the underwater balance along coral reefs in Micronesia.

The U.S. Government became administering authority of the Trust Territory on July 18, 1947, when the President of the United States approved the trusteeship agreement between the United States and the Security Council of the United Nations.

The immensity of the ocean expanse over which the islands are scattered helps to explain the wide variance of culture and language of the Micronesian people. They have had thrust upon them the blessings and burdens of new ways of life, and there is growing concern for the environment in this part of the world where a bountiful harvest from the sea and soil are so vital, and where fresh water is so dear.

Nothing more dramatically underscores the magnitude of the challenge Micronesia faces than the picture of the vast, sheltering, blue-green lagoons, once a haven for a multitude of sea life, now struggling to maintain the delicate ecological balance of the island environment caused by increased urbanization. The threat of lagoon pollution destroying protein sources of sea life, and thus depriving the people of a traditionally important supply of food, looms larger every day. Recognizing the threat is the first step to eliminating it.

Of more dramatic impact, perhaps, has been the modern-day invasion of these islands by the proliferating Crown of Thorns starfish, the apparent beneficiary of an ecological imbalance. The spiny predator feeds on living coral of protective reefs, almost unchecked, multiplying out of control. Research is answering the question "why?"; control programs in all areas are attempting to restore the underwater balance.

On islands where nature has provided, nature must also be protected. The Trust Territory Environmental Early Warning System, initiated by the Secretary of the Interior, requires all Trust Territory employees to report dangers to life and health, human and otherwise, present and potential.

The aim is not to accuse, but to remedy; not to criticize choices neglected nor to search for villains, but to spur greater awareness of the full consequences of our actions and to assure that nature protected today will be nature provident tomorrow.

Weaving provides a link with the past and is a popular art form today.

The Earliest Americans

The first Americans—the Indians—regard the land as their strongest link with the past and their best hope for the future. In more primitive times, land and life were virtually synonymous.

The majority of Indians still live on lands their ancestors called home. But even the growing numbers who venture into urban life and urban occupations still cling to the land-base outlook by keeping tribal ties alive.

Most of the present-day Indian land is in tribal estates—that is, reserves held in common under Federal trusteeship. In some cases, tribal members also hold individual allotments acquired by their families under an 1887 law, now inoperative, that was intended to convert the nomadic peoples into farmers.

Tribal lands are, in effect, Indian domains, just as national parks, forests, seashores and the like are part of the public domain.

Indian holdings total some 50 million acres, or more than two percent of the total area of the Nation. Large blocs of Indian real estate may be found in nearly all parts of the country, from the Florida Everglades to the Arctic rim, with scatterings along the eastern seaboard. The Federal Government's trust responsibility is largely confined to lands in 26 States, most of which are west of the Appalachians.

Many present-day Indian holdings were acquired by treaty or other agreements with the United States, beginning at the turn of the 19th century when the population boom on the East coast precipitated decades of forcible removal of Indians westward. The Gold Rush brought about an additional confrontation, that time with the Indian Tribes that were native to the American West.

Much of the land that was reserved for Indians following 19th century Indian wars was barren, remote and scarcely productive enough to support the tribal populations. Today, however, many of the once-isolated areas are in the path of heavy tourist traffic; and forest, water and mineral reserves offer tremendous potential for economic improvement.

Rural Indian communities frequently represent a segment of America seemingly bypassed. Until very recent years, the Nation's economic development efforts for depressed areas did not embrace most Indian communities. The present challenge is to make up for lost time.

Many American tourists visiting rural Indian areas are struck by contrasts in the standards of living between Indians and non-Indians. Although the cause is often basically economic, sometimes it is by choice that the Indian community clings to its traditional forms as a means of retaining cultural links with its own past.

A classic example of the tie between land and culture is highlighted in the long-standing request of the New Mexican Pueblo de Taos Indians for return to their possession of 48,000 acres of land in the sacred Blue Lake area. The land was taken as a national forest in 1906, and the Taos Indians, who adhere to a theocratic socio-political structure, assert that the sacred lands have been violated by tourists, miners, loggers and others.

Legislation to restore the Blue Lake sacred lands to Taos ownership was proposed by President Nixon and enacted by the 91st Congress.

Public sympathy for Indian causes such as this is all too often overlaid with a sentiment that Indian Americans are something out of the pages of history and unrelated to today's world. Some of the younger and more outspoken generation are demanding an answer to their question: "Why are we made to feel irrelevant in the American society simply because we make open effort to retain our Indian-ness?"

To help bridge such seeming gaps, the present Administration has instituted a number of policy changes in Indian affairs designed to bring Indians into the orbit of planning and executing business affecting their daily lives.

On July 8, 1970, President Nixon sent a message to Congress calling for basic changes in the special relationships between the Federal Government and the tribes,

with programs directed toward broadening economic and educational opportunities for Indians in ways that will reinforce rather than diminish ethnic pride.

Development of the human resources and development of the natural resources found in Indian communities are being approached as interrelated and interdependent objectives.

Indians have been placed in key positions in the Bureau of Indian Affairs. The new commissioner is the third Indian in history to hold that post. Administrative and budget operations, tribal relations and legislative activities are under Indian direction, and Indians are in key posts related to education and economic development, too. The structure of the BIA is shifting from a management to a service organization, permitting broader exercise of Indian control at local levels.

To coordinate Federal efforts for Indian community development, and thus get the most mileage from appropriations for Indian aid (this year over $700 million), the Vice President functions as Chairman of a special body—the Council on Indian Opportunity. Members include eight Cabinet officers and eight prominent Indians selected for their various fields of competence and their familiarity with specific regions of the country having high Indian populations. The new Indian members of the NCIO began their work in August 1970, with a series of regional meetings with tribal groups to probe the problems adversely affecting Indian community development.

To realize local involvement of Indians in issues relating to their lands and resources, the President introduced a plan to permit tribal governments to take over operation of programs and facilities of the BIA, if the tribe so wishes. At the same time, he reaffirmed the concept of continuing Federal responsibility for Indian trust lands and Indian people, thus expurgating the old spectre of Federal "termination" that has inhibited Indian self-propulsion.

The objective, in the President's words, is to "strengthen the Indians' sense of autonomy without threatening his sense of community."

As a result, Indian tribal groups are taking a more active and persistent stance in planning improvement projects and programs. They also reveal a quick appreciation of the fact that Indian areas are often dependent upon growth in surrounding non-Indian areas, and thus intercommunity developments are taking place.

Illustrative of the new look in a growing number of Indian communities are such enterprises as the following, all of which have materialized within the past year:

—An Indian Business Development Fund was created in the BIA to provide seed money for establishment or expansion of Indian-owned small businesses in local Indian areas.

—Stepped-up housing construction produced 8,000 new or fully remodeled homes for rural Indians last year and the same number annually is projected for the next four years. This is a joint program of the BIA and the Department of Housing and Urban Development (HUD).

—The Gila River reservation in Arizona, situated in the general growth area of Phoenix, has been designated a

Model Cities Area under a HUD program, thus becoming eligible for sizeable funds for development over the next five years. Planning and development will be in cooperation with neighboring towns.

—A new industry is opening on an Indian reservation at the rate of about one every two weeks, creating thousands of new jobs that are helping reverse Indian unemployment statistics. In some areas, Indian joblessness had been 10 times the national average. Industrial and commercial development specialists in the BIA function as advisors to Indians in negotiating contracts with private industries.

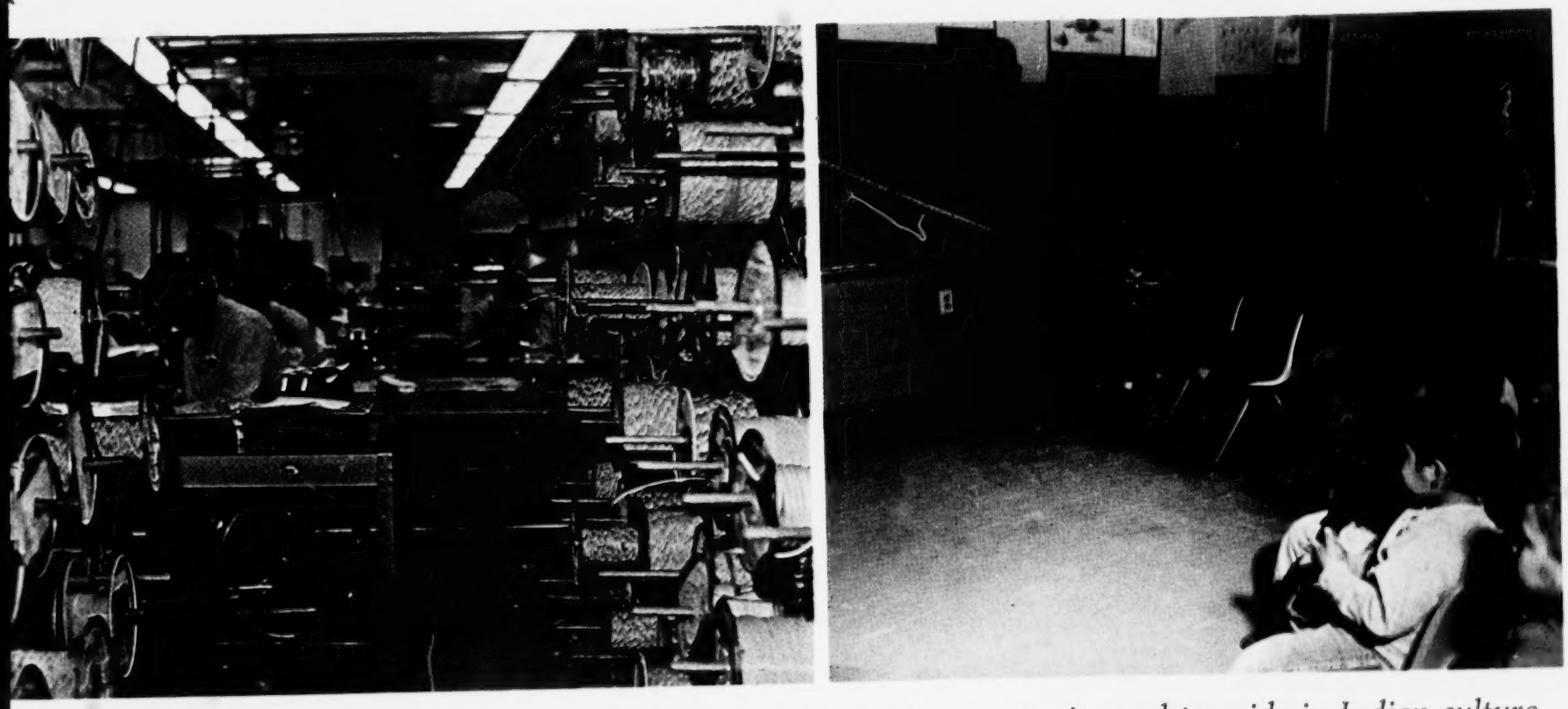
—Grants and loans for construction of industrial plants, tourist facilities, shopping areas and similar economic improvements are also finding their way to Indian tribal lands through the Economic Development Administration, which expended nearly $20 million in 1970 for Indian aid.

—A million-dollar contract was recently negotiated with the United Tribes of North Dakota Development Corporation for the latter to operate a training center at Bismarck, North Dakota, on the site of a former Job Corps Center. The new Indian enterprise offers "whole family" training, which includes remedial education for the breadwinner, skill training in the occupation of his choice and homemaking orientation for the homemaker.

—Most notable in the 1970 picture is the takeover by the Zuni Tribe of New Mexico of all operations formerly performed by the BIA, under a contract with BIA. Thus, all resources development programs and social and educational services are in the hands of the tribe itself.

Other contracts to Indians for services include roadbuilding and the operation of local schools in a few Indian communities.

Large-scale activity in mining and oil explorations are taking place in at least a few Indian areas that heretofore had offered little in the way of economic promise. Leases



Education is the key to improved economic opportunity and to pride in Indian culture.

provide safeguards against destruction of the ecology in the mining and drilling areas.

Sustained yield practices on the rich forest reserves of many of the tribes—particularly those in the far Northwest—are paying off in steady annual increases in revenues to the tribes from cutting and from processing operations.

Some large-scale commercial farming and ranching is also found on Indian reservations, although capitalization for Indian ventures usually is scarce. Irrigation projects financed by BIA have made former desert areas highly arable. (Proposals for a guaranteed loan fund, under consideration by the 92nd Congress, are aimed at encouraging more large-scale Indian enterprises.)

The Navajos have established a community college geared to training tribal members in farming and other occupations. An experimental farm is in operation as a training ground for Navajos who look forward to farming their own acreage as construction of the massive Navajo Irrigation Project progresses. This project is on the eastern side of the reservation.

Indian development is sometimes hampered by legal constraints.

A far-reaching new proposal by President Nixon would establish an Indian Trust Council Authority to serve as the Indians' legal counsel and advocate, with authority to defend Indian property rights in cases against the Government. Conflicts of interest sometimes arise, particularly in connection with Indian water rights. Under a 1908 Supreme Court decision, Indians are considered to hold first rights to waters originating upon or traversing their trust lands. Sometimes the waters also traverse public lands, and water requirements of the general population, particularly in the West, are likely to be at odds with Indian claims.

In line with other Presidential recommendations, the Department also proposed legislation to create within the Department of the Interior a new Assistant Secretaryship to be concerned exclusively with Indian affairs and affairs of the Territories; and for settlement of a century-old lands claim of the Alaska Natives.

President Nixon has said:

"The recommendations of this Administration represent an historic step forward in Indian policy. We are proposing to break sharply with past approaches to Indian problems. In place of a long series of piecemeal reforms, we suggest a new and coherent strategy. In place of policies which simply call for more spending, we suggest policies which call for wiser spending. In place of policies which oscillate between the deadly extremes of forced termination and constant paternalism, we suggest a policy in which the Federal government and the Indian community play complementary roles.

"But most importantly, we have turned from the question of *whether* the Federal government has a responsibility to Indians to the question of *how* that responsibility can best be fulfilled. We have concluded that the Indians will get better programs and that public monies will be more effectively expended if the people who are most affected by these programs are responsible for operating them.

"The Indians of America need Federal assistance—this much has long been clear. What has not always been clear, however, is that the Federal government needs Indian energies and Indian leadership if its assistance is to be effective in improving the conditions of Indian life. It is a new and balanced relationship between the United States government and the first Americans that is at the heart of our approach to Indian problems. And that is why we now approach these problems with new confidence that they will successfully be overcome."

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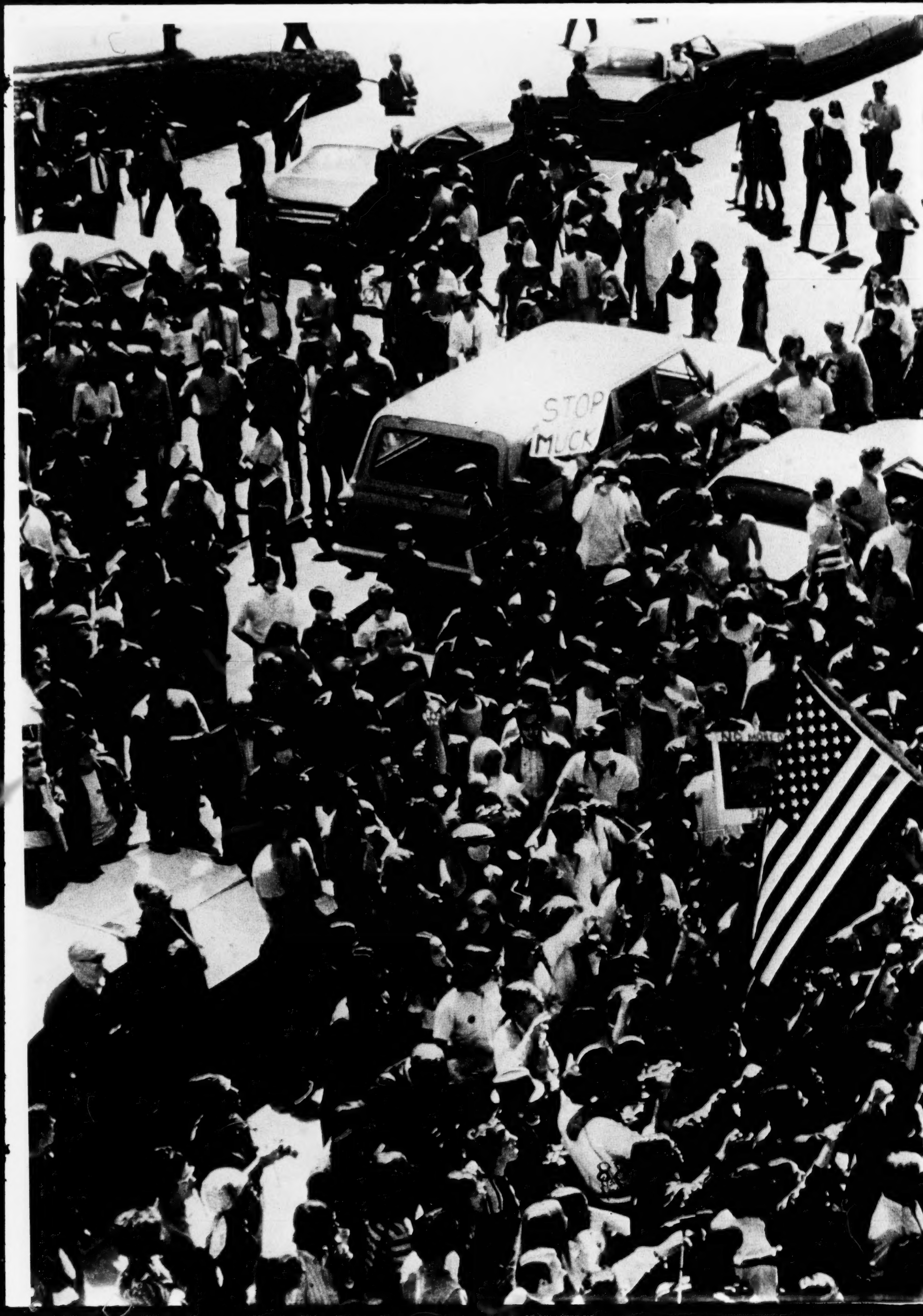
Summing Up

"The age of environmental awakening has come upon America, as never before in our history. We would have to look back to the days of Theodore Roosevelt and Gifford Pinchot for a similar impact upon the American consciousness of the need for environmental management.

"But today, the stakes are higher and the issues far more serious than in the early years of this century. Indeed, our very survival on the planet earth may well be in the balance if we cannot restore and maintain some measure of ecological balance. We have found our way to the moon. We must find the way to cope with the technological society that made our moon adventure possible."

Governor Kenneth M. Curtis
Chairman, National Resources and
Environmental Management Committee
National Conference of Governors


STOP
MUCK

Summing Up

In previous generations, the bountiful goodness of the earth was taken for granted. Now we must actively work to assure maintenance of a quality environment.

In the long view, 1970 may be pinpointed as the start of the Environmental Renaissance. It was the first time in history that anyone thought of setting aside a day to honor the Earth itself. Earth Day—a spontaneous movement arising from deep-rooted love of the land and remorse for the ways it is being despoiled; a reminder that man and his environment are all parts of the same package—a thing called life.

When at last man attained his age-old yearning to reach the moon, he learned, in the first moments of exploring its bleak surface, to appreciate the Earth with the fullness of commitment to it. He saw the Earth at last for what it is—finite and fragile, but altogether wonderful, an object of more complexity than all his sophisticated technology can match. Man has come to understand that his future will not be determined by star-gazing, but by learning to protect the frail structure of his own planet.

Thus a new dimension is being added to the political character of the world's nations, our own included. An environmental ethic is rising out of man-induced environmental catastrophes.

Industrial wastes threaten stream quality.

In its best moments, the American national character—the attitudes and dreams of its people—have reflected the greatness of this piece of geography we call the United States.

In moments not so admirable, the American national character has reflected the ailments that we, the people, have inflicted upon the land. As the land is torn, so the people are torn.

The year 1070 was the time when we began in earnest to take stock of ourselves and the environment we have created. It was a year of more than will-o-the-wisp awareness that all is not well. It was a year of action to restore compatibility to the relationship between man and nature.

Ecologists, environmentalists, conservationists, a rising number of industrialists motivated by social conscience, and an army of the general public went to war on pollution.

Detergents, plastics, auto engines, pesticides, fungicides, fertilizers, herbicides and poisonous chemicals used in manufacturing and food processing all came under attack.

Ammunition was plentiful, in the form of vital statistics indicting the life styles and value systems that were leading us to diminishing returns of comfort, health, safety and security.

Jacques Cousteau, noted explorer of the underwater world, reported in 1070 that during the past 20 years 40 percent of life in the oceans has been choked off.

A Florida teenager contracted a mysterious and fatal ailment—reported to have been caused by toxins absorbed while he was scuba diving in a lake near his home.

Exhausts from city traffic pollute the air.

The children in a New Mexico family were paralyzed and blinded from mercury poisoning traced to the protective coating on seed used as feed for hogs the family raised for its own food supply.

Residents along the shores of Lake George in New York State were warned not to eat fish caught there because of the lethal levels of mercury contamination. Federal authorities seized thousands of pounds of DDT-contaminated kingfish caught off the Los Angeles coast.

And there are other less specific but more pervasive evidences of a decline in the overall environment in which Americans have been living. The swift and haphazard materialization of the megalopolis has brought suffocating congestion to airways and roadways, caused power blackouts threatening the health and safety of millions, and forced center cities to congeal into overcrowded population pockets plagued by social and health problems. The National Institute of Environmental Health Sciences reported in 1970 that ill health induced by unfavorable environmental conditions costs Americans $35 billion a year.

Yet all of these signs of malaise are only one part of the 1970 picture. The record of progress in environmental quality control is worthy, indeed.

Water quality standards for all 50 States were approved, and prosecution became a matter of hard policy against industries contaminating American waters thermally, chemically, or with metals, oil, sewage or other waste.

Deadly pesticides—and unsightly billboards—were banned on all Federal lands under jurisdiction of the Interior Department. The importation

Jetport construction near the Everglades was halted.

of numerous endangered wildlife species, or products derived from them, was prohibited under new, stiff Interior regulations.

Environmental protection became a built-in first step in planning pipelines, powerplants and powerlines on Federal lands under Interior's administration.

Wilderness and scenic regions in the vicinity of metropolitan areas were saved from indiscriminate uses in many parts of the country. For example, a super jetport near the Florida Everglades was halted at midpoint because of its potential threat to the fragile ecology and unique wildlife in the area.

Studies began for developing major recreation areas adjoining 13 of America's most crowded cities. Congress authorized substantial increases in money for acquiring open space land under the Land and Water Conservation Fund.

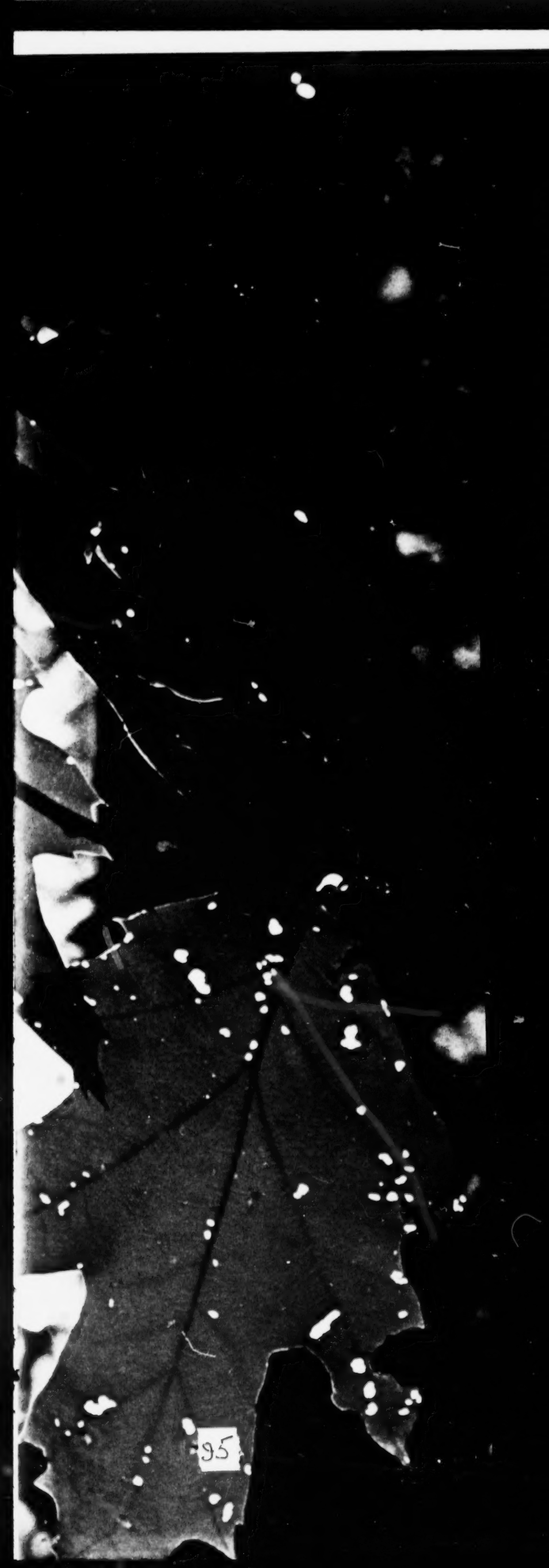
Curriculum materials and study centers for environmental education were developed under Interior's aegis—and the President signed into law the Environmental Education Act for community education, teacher training and special programs for community, business and labor groups and government employees.

The year 1970 also brought forth the first report of the Council on Environmental Quality which President Nixon created in late 1969. The report spelled out, with clarity and forthrightness, the environmental state of the union. It probed such matters as "misplaced economic incentives," the information gap between technology and the public, the value systems that motivate us, and the limitations of governmental units. It also critically examined land-use policies, the extent of water and air pollution, the effects of pollution from noise, pesticides and radiation, and man's modification of weather and climate. It called for environmental education programs, financial reforms for environmental control, monitoring and research systems and a comprehensive environmental control policy.

Also created in 1970 were the Environmental Protection Agency and the National Oceanographic and Atmospheric Administration.

And, near the close of the year, the President signed a Joint Resolution of the Congress proclaiming that "Clean Waters for America Week" be observed the first full calendar week in May each year.

The pristine beauty of raindrops on a leaf is only part of the environment. For many of us, the major determinant of environmental quality is the view from a building or from a city park.



By no means all the action took place at the Federal level. Perhaps one of the most significant State-level developments in 1970 was the concerted effort to improve the effectiveness of State agencies dealing with environmental problems. And the National Conference of Governors established a National Resources and Environmental Management Committee naming Governor Curtis of Maine as chairman.

The direction of the States' interests are typified by language in the State of Washington's new law establishing a Department of Ecology. The law says: ". . . the legislature recognizes that as the population of our State grows, the need to provide for our increasing industrial, agricultural, residential, social, recreational, economic and other needs will place an increasing responsibility on all segments of our society to plan, coordinate, restore and regulate the utilization of our natural resources. . . ."

Something as mundane as the District of Columbia telephone directory for 1970 gives a clue to the extent of public concern. No fewer than 28 listings appear under the prefix "enviro"—private groups, industries and citizen organizations devoted to environmental projects and issues. In 1000 there were no such listings in the Nation's Capital.

In this spirit the journey continued in 1970 toward an environmental ethic.

President Nixon set the tone in his State of the Union message. In the next 10 years, he reminded all Americans, we shall increase our wealth by 50 percent. But, he asked, does this mean that we will be 50 percent richer in a real sense, 50 percent better off, 50 percent happier?

He responded to his own questions in these words: "The answer is not to abandon growth but to redirect it. . . . America, which has pioneered in the new abundance and in the new technology is being called upon today to pioneer in meeting the concerns which follow in their wake—in turning the wonders of science to the service of man. . . ."

We begin by counting our blessings.

Our national assets include a population of well over 200 million human beings, nearly 50 million of whom are still in school, and some 80 plus million of whom constitute our employable strength. The educational level of Americans is rising dra-

America! America!
God mend thine every flaw,
Confirm thy soul in self-control
Thy liberty in law!

America the Beautiful, Katharine Lee Bates

matically, with college enrollments doubling between 1060 and 1070.

We have cattle valued at $17 billion, hogs valued at $1.8 billion, sheep valued at $466 million. Our farm crops yield abundantly such staples as cotton, corn, rice, peanuts, wheat, oats, potatoes, hay, barley, soybeans, flaxseed, to name but the biggest.

Mineral production figures show the United States leading the world in output of aluminum, bituminous coal, copper, natural gas, steel, potash and sulphur. We also produce a huge share of the world's crude oil.

We have nearly 4 million miles of U.S. highways and nine of the 10 busiest airports in the world. We lead the world in nuclear power capacity, with a potential seven times that of the Soviet Union. Our electrical energy output per capita is three times that of the Soviet Union and is rivaled only by Sweden. Our streams average a flow of 1,200 billion gallons of water per day, many times the daily average consumption in a country that is a giant consumer.

The United States of America adds up to 3.6 million square miles of verdant plains, vast timberlands, lakes, rivers and some of the most scenic mountain and valley regions in the world, with climates to suit any taste.

And we have acquired the sense of necessity for planning on a national and even global scale for environmental quality.

Thus we have the makings of civilization as Herbert Spencer defined the word—"a progress from an indefinite, incoherent homogeneity toward a definite, coherent heterogeneity."

The President summed up our condition and our prospects in his Message to Congress transmitting the first report of the Council on Environmental Quality:

"At the heart of concern for the environment lies our concern for the human condition: for the welfare of man himself, now and in the future. As we look ahead to the end of this new decade of heightened environmental awareness, therefore, we should set ourselves a higher goal than merely remedying the damage wrought in decades past. We should strive for an environment that not only sustains life but enriches life, harmonizing the works of man and nature for the greater good of all."

THE CHASM OF THE COLORADO, Thomas Moran

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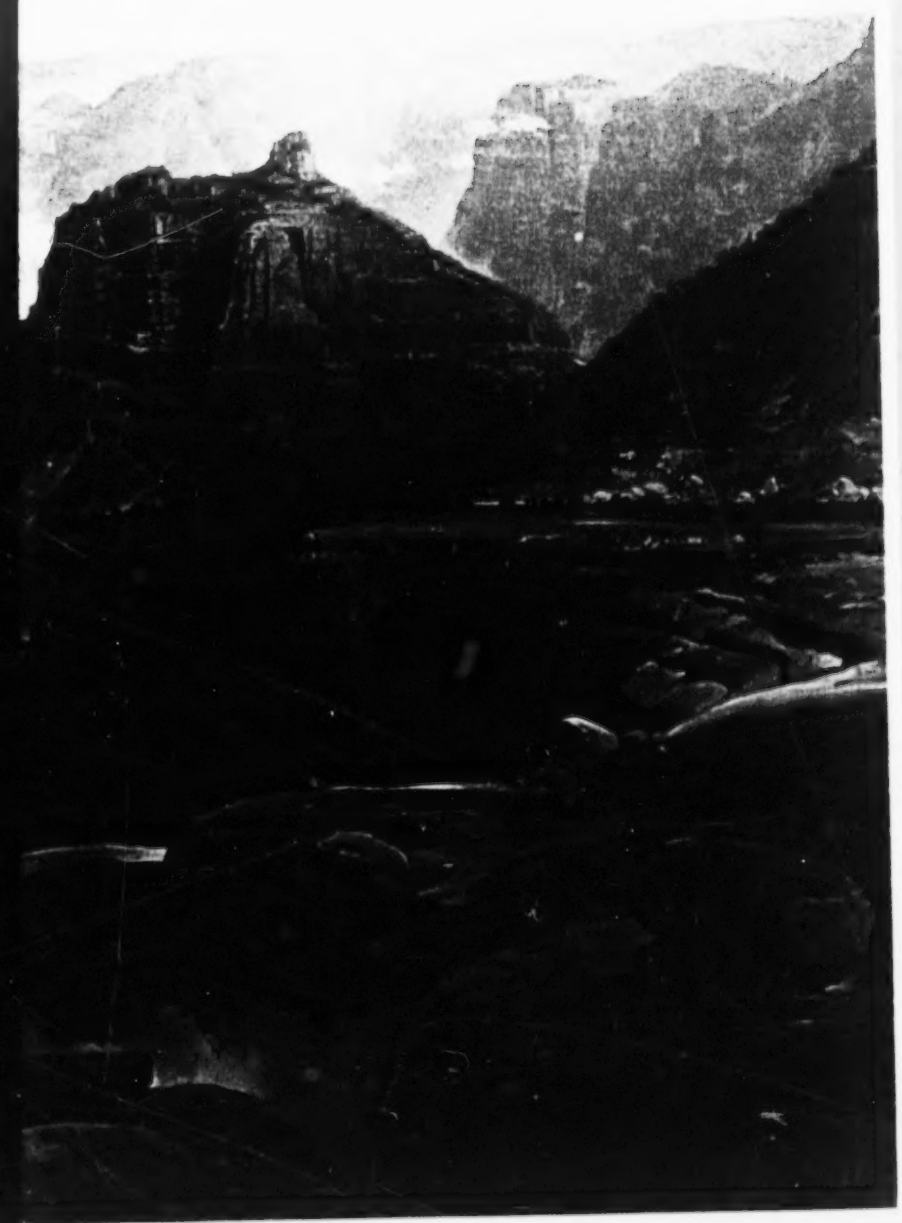

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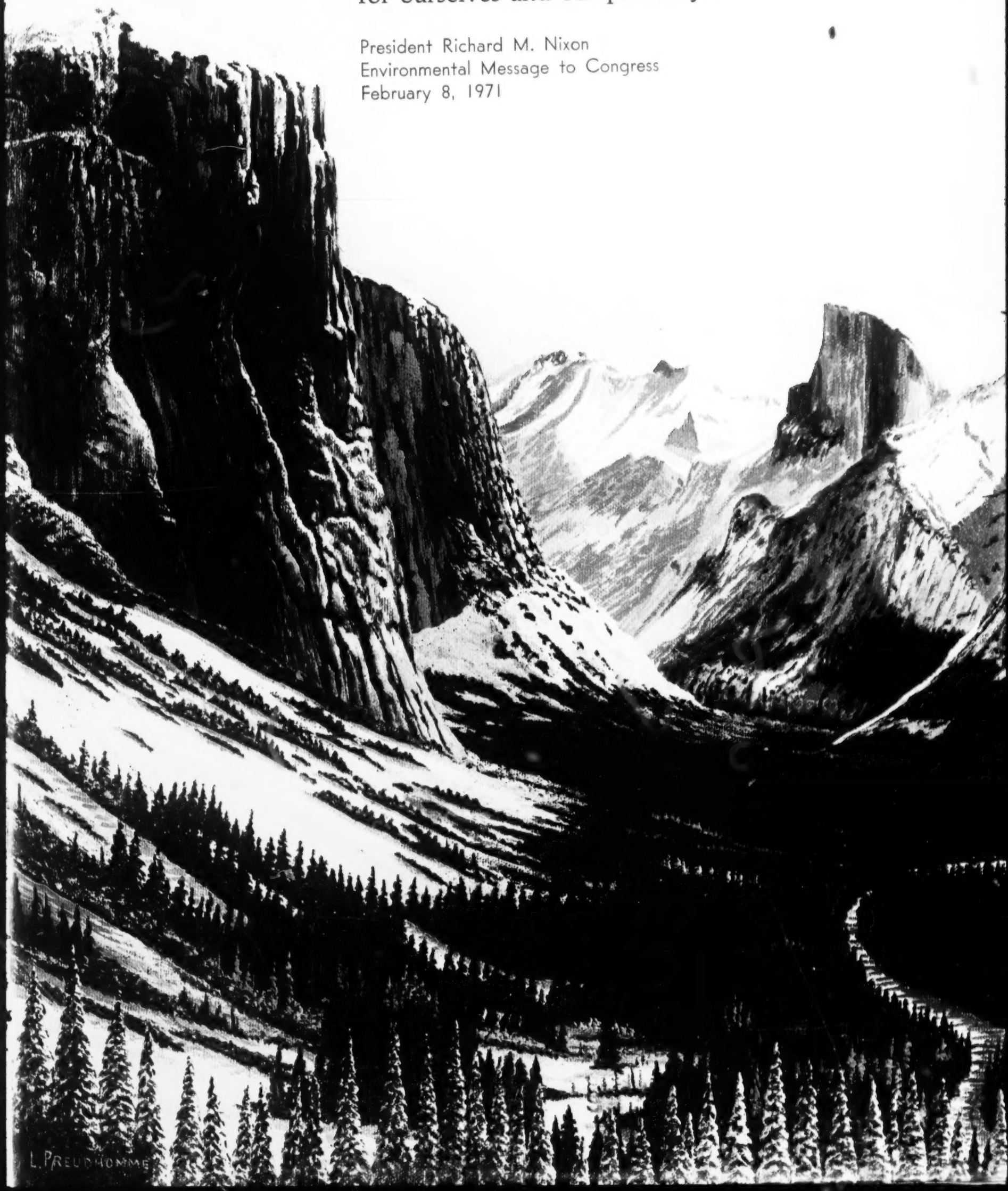
President Richard M. Nixon
Environmental Message to Congress
February 8, 1971